R05-90

SBIR - 08.01-0540A
release date - 5/02/92

MAGNETIC BEARINGS FOR A HIGH-PERFORMANCE OPTICAL DISK BUFFER

VOLUME II

SatCon Technology Corporation
12 Emily Street
Cambridge, MA 02139

Contract No. NAS5-30309

May 1990
Final Report for Period May 1988 - April 1990

Prepared for

Goddard Space Flight Center
Greenbelt, Maryland 20771

VOLUME II

Operating Instructions

A. Front Panel Layout

Leftmost on the front panel are five pairs of test points which give the user access to the position signals from the five magnetic-bearing control loops. From left to right, the signals and their scale factors are:

x-axis displacement	77 microns/volt
z-axis displacement	90 microns/volt
x-axis rotation	3.6 milliradians/volt
y-axis rotation	1.4 milliradians/volt
z-axis rotation	0.22 milliradians/volt

The leftmost switch on the front panel opens and closes the five magnetic-bearing control loops simultaneously using a start-up/shut-down procedure which takes approximately 5 seconds to complete.

The next switch on the front panel controls the DC power to the magnetic-bearing controller circuitry; the green LED to the right of the switch illuminates when the DC power is on.

Rightmost on the front panel is the switch which controls the AC power to the chassis, and the AC power-on light and line fuse.

B. Turn-On Procedure

The normal procedure for turning on the system is as follows:

1. Turn on the AC power to the chassis.
2. Turn on the DC power to the controller.
3. Place the "Control Loops" switch in the CLOSED position. Wait 5 seconds for start-up procedure.

C. Shut-Down Procedure

The normal procedure for shutting off the system is as follows:

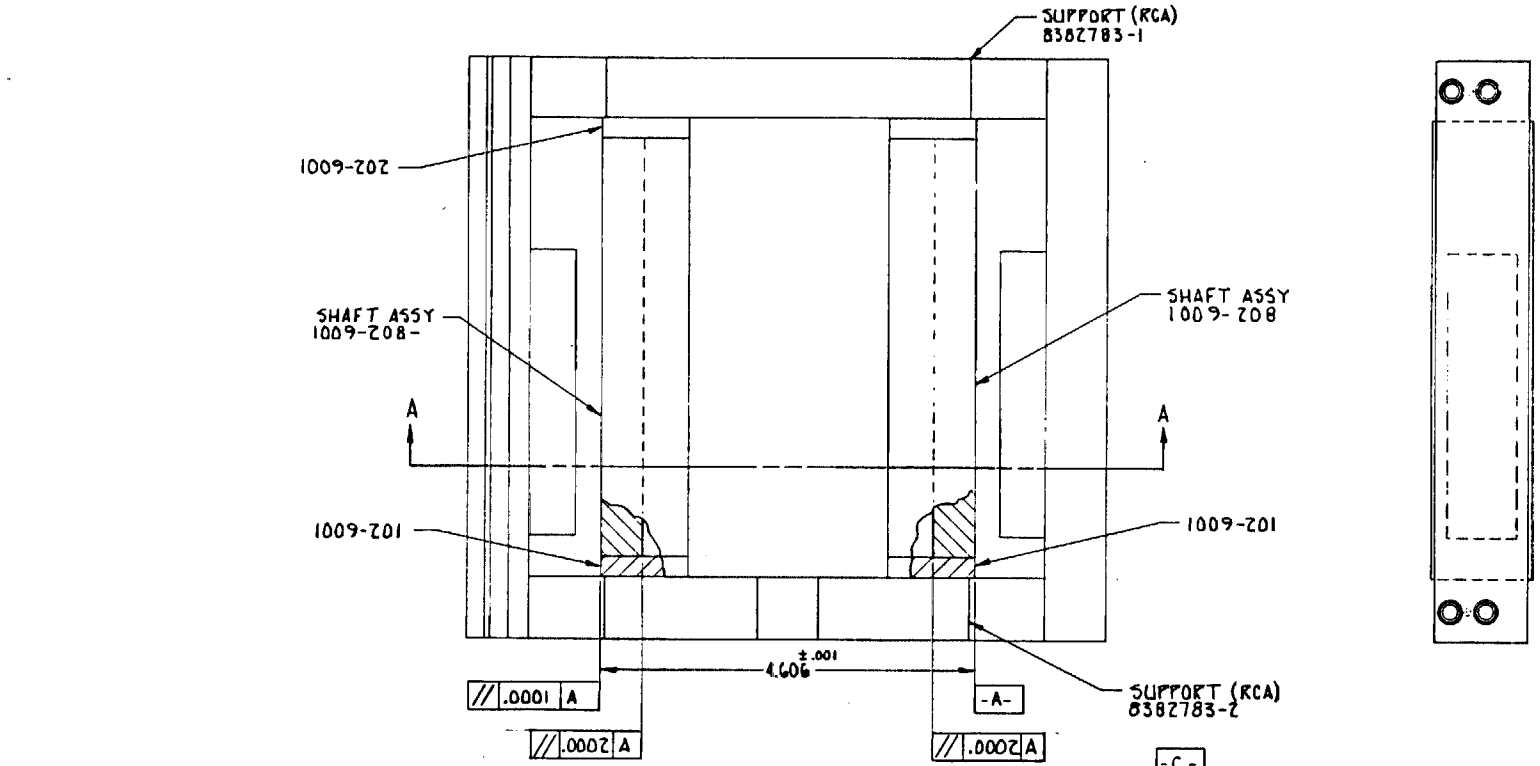
1. Place the "Control Loops" switch in the OPEN position. Wait 5 seconds.
2. Turn off the DC power to the controller.
3. Turn off the AC power to the chassis.

D. Latch-Up Protection

Should the orientation of the translator become such that the control loops cannot return it to its nominal position, the protection circuitry will automatically cycle the system through both the shut-down and start-up procedures in an attempt to recover control. This process takes approximately 10 seconds to complete.

DWG NO.	DWG NAME	DATE
1009-300	Frame Assy	23 May 89
1009-301	Transport Assy	28 Jun 89
1009-302	Layout-Force Sensor Assy	6 Jul 89
1009-303	Mount, Carriage-Force Sensor Fixture	18 Jul 89
1009-304	Stiffener	1 Aug 89
1009-305	Layout/Holding Fixture	11 Aug 89
1009-306	Mounting Bar, Rear	11 Aug 89
1009-307	Mounting Bar, Front	11 Aug 89
1009-309	Support Gusset	12 Oct 89
1009-310	Adapter, Milling Machine	20 Nov 89
1009-311 Rev A	Spacer, Transport-1	17 Jan 90
1009-101	Pole	20 Aug 88
1009-102	Base Plate	20 Aug 88
1009-103	Pole Piece, X-Axis	12 Jun 89
1009-104	Gusset Bracket	12 Jun 89
1009-105	Gusset Spacer	11 May 89
1009-106	Annealing Instructions	
1009-107	Annealing Instructions	
1009-108	Shaft Assembly Instructions	10 Jun 89
1009-109	Toroid	23 Apr 90
1009-110	Bearing Magnet	12 Jun 89
1009-111	Pole Piece Assy	14 Jun 89
1009-112	Bushing, Force Sensor Test Fixture	19 Jul 89
1009-200	Pole Piece, Z-Axis	11 May 89
1009-201	Plate, Adapter, Outer	11 May 89
1009-202	Plate, Adapter, Inner	11 May 89
1009-203	Shaft, Magnetic Bearing	11 May 89
1009-204	Plate, Upper Transport	11 May 89
1009-207	Magnetic Bearing Assy	20 May 89
1009-208-X	Shaft Assy	23 May 89
1009-209	Bar, Upper - Flux Return	20 Jun 89
1009-210	Bar, Lower - Flux Return	20 Jun 89
1009-211	Support, Inner Frame	20 Jun 89
1009-212	Support, Outer Frame	20 Jun 89
1009-213-X	Spacer, Flux Return	21 Jun 89
1009-214	Target	20 Aug 88
1009-215	Sensor Mount	30 Aug 88
1009-216	Mount, Force Sensor-Left	17 Jul 89
1009-217	Mount, Force Sensor-Right	18 Jul 89
1009-218	Block, Frame/Sensor Interface	18 Jul 89
1009-219	Base Plate, Force Sensor Test Fixture	19 Jul 89
1009-220	Winding Plate, X-Axis	31 Jul 89
1009-221	Winding Plate, Z-Axis	4 Aug 89
1009-222	Mock-up, Encoder Block	9 Aug 89
1009-223	Base Plate, Holding Fixture	15 Aug 89
1009-224	Clamp, Holding Fixture	15 Aug 89
1009-225	Holder, Rod - LVDT	20 Aug 89
1009-226	Mount, LVDT	29 Aug 89
1009-229	Optical Head Mock-up	2 Feb 90
1009-230	Schematic, Magnetic Bearing Controller	2 Feb 90

DWG NO.	DWG NAME	DATE
1009-231	Schematic, Start-up Circuit	2 Feb 90
1009-232	Schematic, Capacitive Sensor Interface	2 Feb 90
1009-233	Schematic, 16 kHz Sinewave Generator	2 Feb 90
1009-240	Layout, Magnetic Bearing Controller	
1009-241	Layout, Start-up Circuit	
1009-242	Layout, Capacitive Sensor Interface	
1009-243	Chassis Interwiring Diagram	



SECTION A-A

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

SCALE: 1/1 DATE: 23MAY 89	APPROVED BY Tim Hawley 7-1-89	DRAWN BY KMA

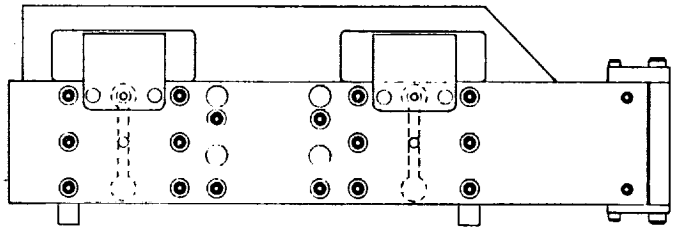
FRAME ASSEMBLY

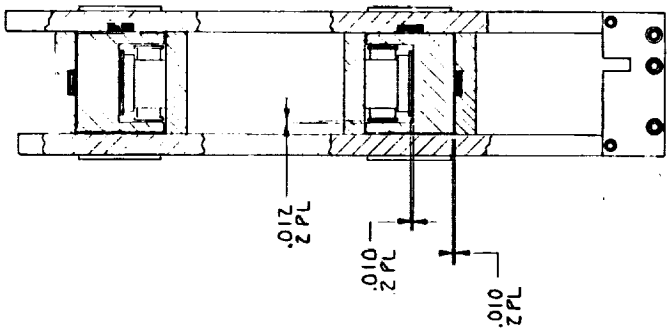
DRAWING NUMBER
1009-300

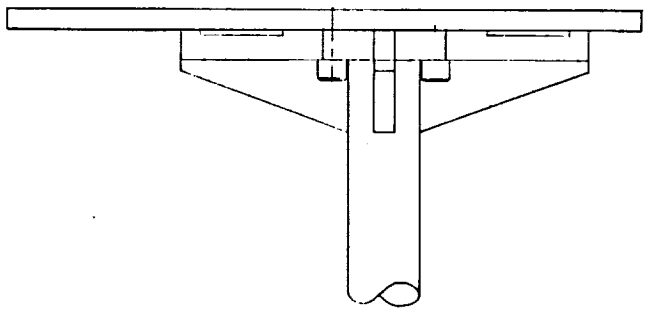
SCALE: 1/1	APPROVED	DRAWN BY KMA
DATE: 28JUN89		

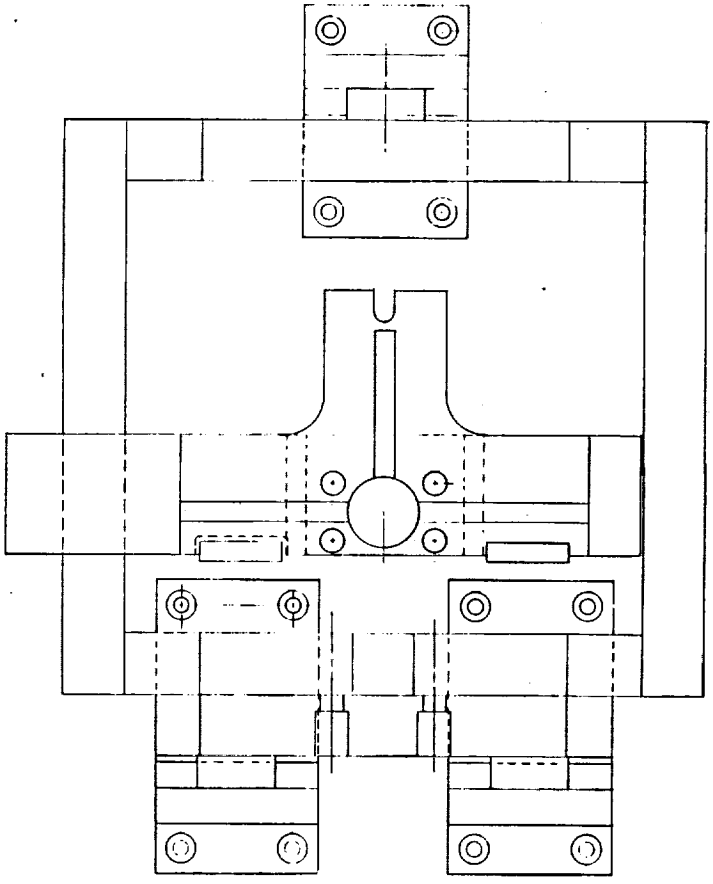
TRANSPORT ASSY

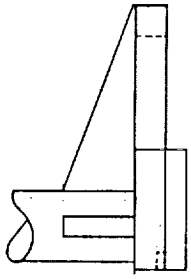
DRAWING NUMBER 1009-301

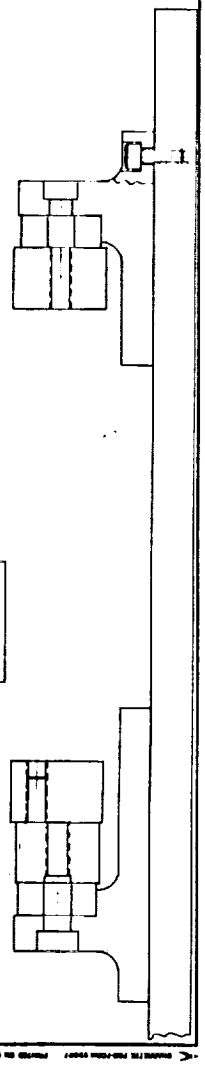








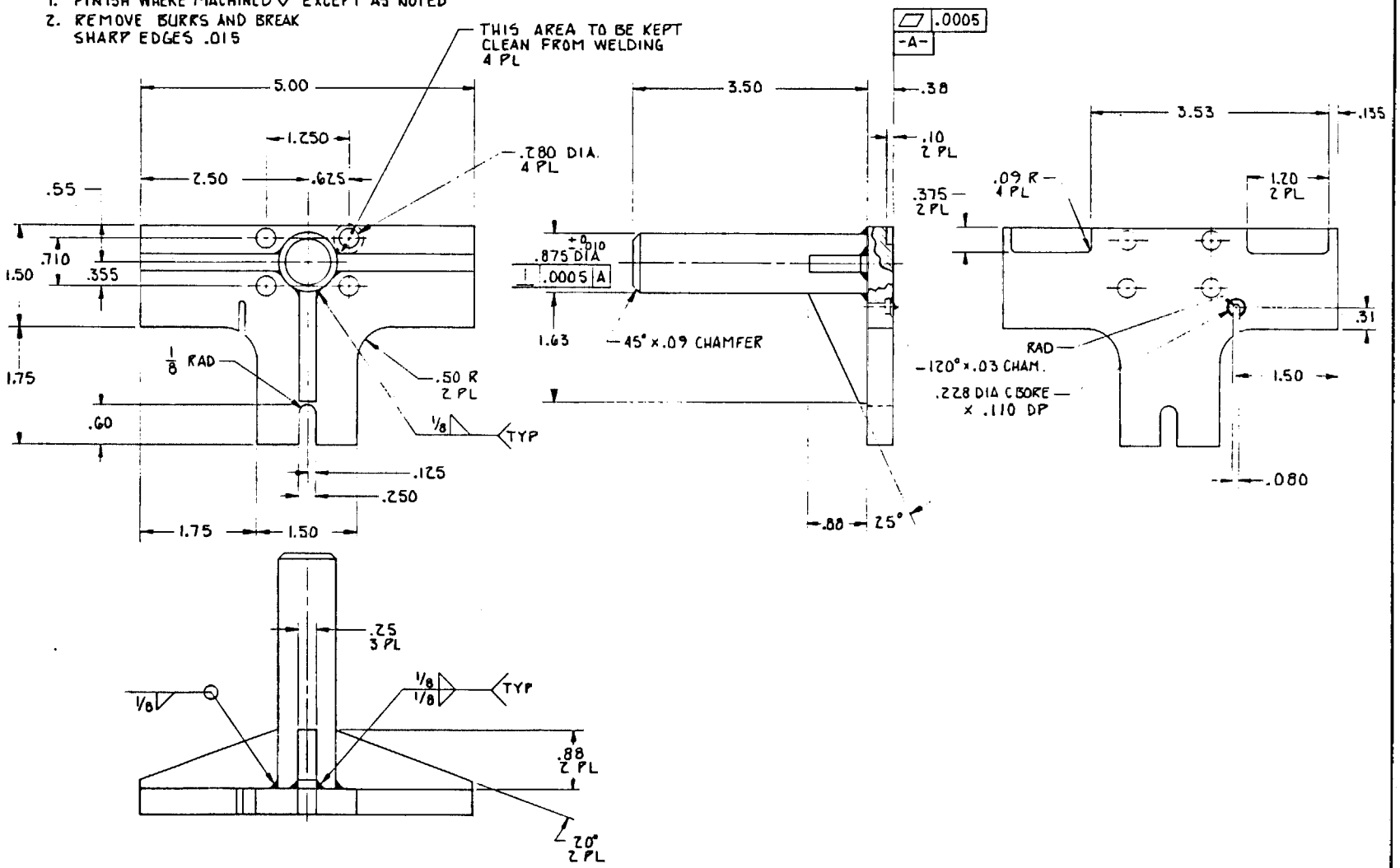




SCALE 1/1	APPROVED	DRAWN BY KMA	
DATE 6JUL89			DRAWING NUMBER 1009-302

LAYOUT - FORCE SENSOR ASSY

NOTES:
1. FINISH WHERE MACHINED 63 EXCEPT AS NOTED
2. REMOVE BURRS AND BREAK SHARP EDGES .015



TOLERANCES		
X/x	.XX	.XXX
± 1/32	± .01	± .005

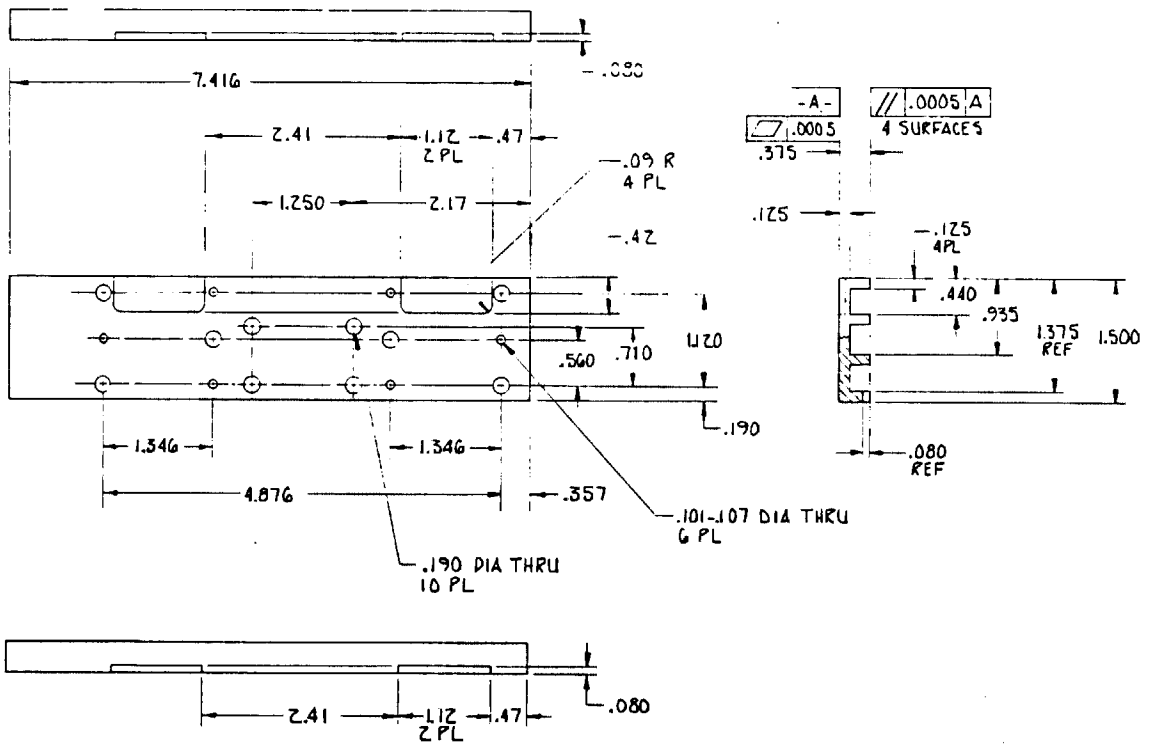
SCALE 1/1 | DATE 18 JUL 89 | APPROVED Tully A. Hollis | DRAWN BY KMA | CHECKED:

MOUNT, CARRIAGE – FORCE SENSOR TEST FIXTURE

MATL: ALUM ALLOY 6061-T651 | FINISH: BLACK ANODIZE | DRAWING NUMBER 1009-303 | REV A

NOTES:

1. FINISH WHERE MACHINED 63
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX

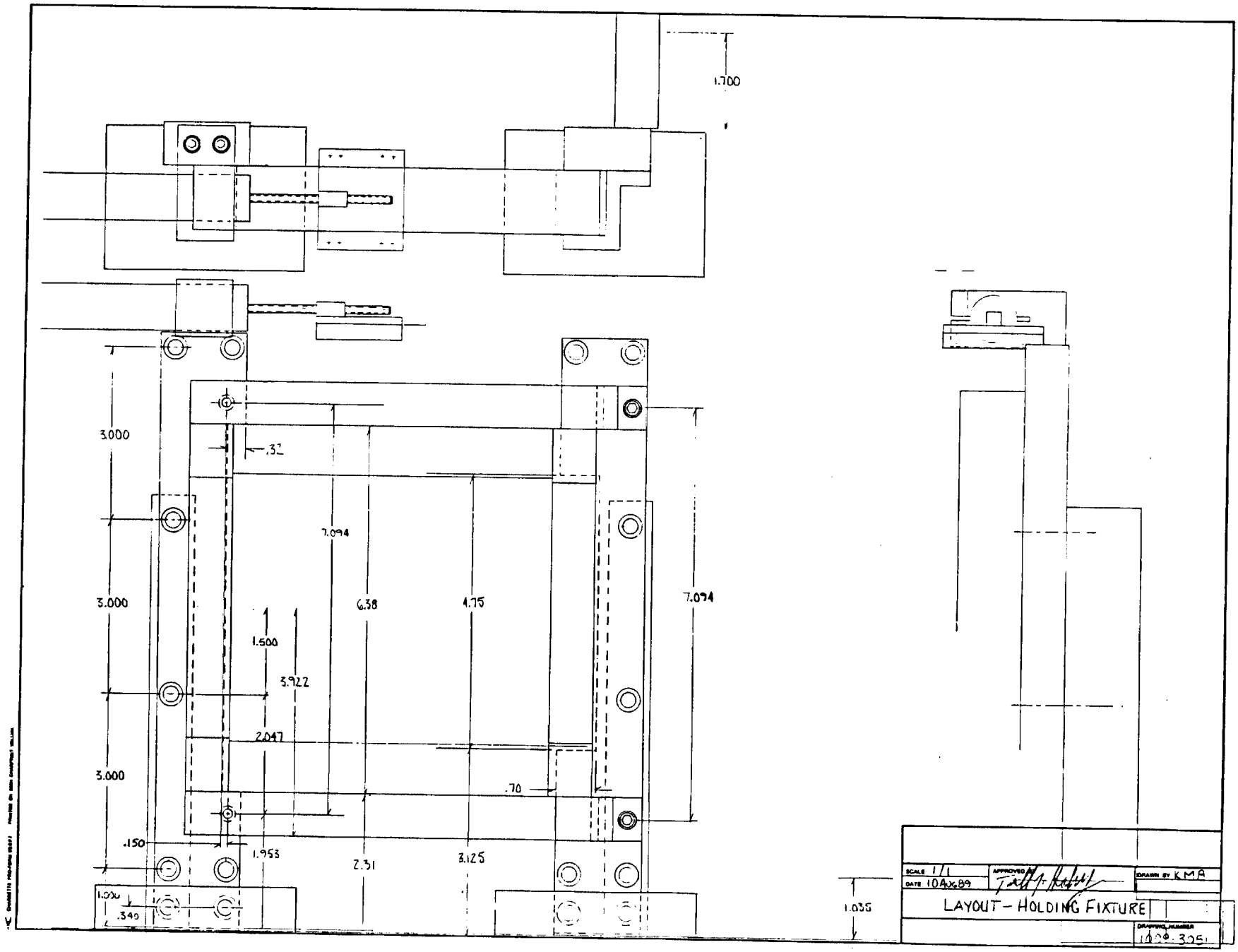


TOLERANCES		
X/x	.XX	.XXX
±1/32	±.01	±.005

SCALE 1/1	APPROVED BY	DRAWN BY KMA
DATE 1 AUG 89		

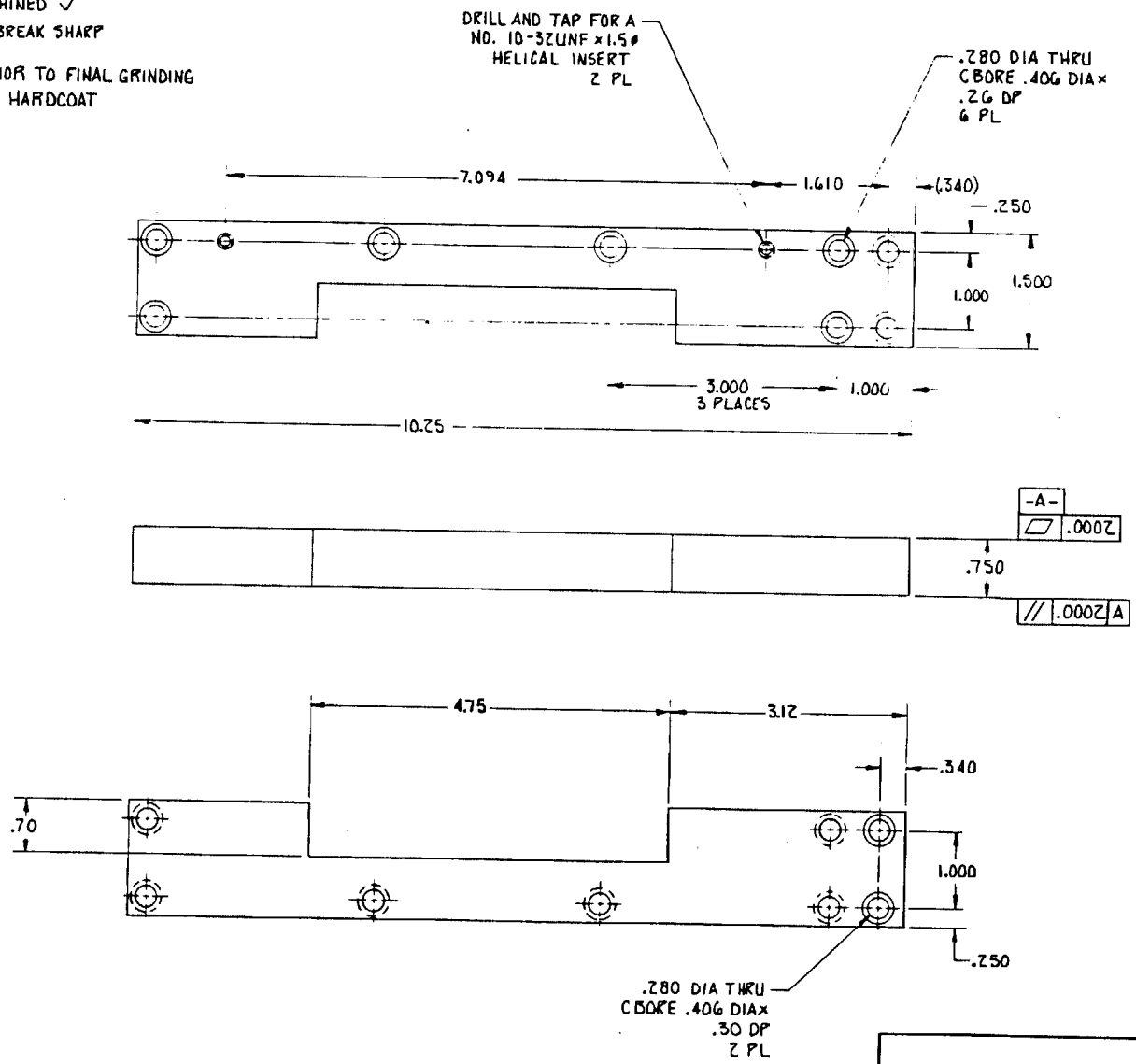
STIFFENER

MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-304	REV B


1.700
3.000
.32
7.094
3.000
6.38
4.75
7.094
1.500
3.922
2.047
3.000
.70
.150
1.953
2.31
3.125
1.000
.340
1.035
SCALE 1/1
DATE 10AUG89
DRAWN BY KMA
LAYOUT - HOLDING FIXTURE
1000-305

NOTES:

1. FINISH WHERE MACHINED 63
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX
3. STRESS RELIEVE PRIOR TO FINAL GRINDING
4. FINAL GRIND AFTER HARDCOAT



TOLERANCES		
x/x	.XX	.XXX
± 1/32	± .01	± .005

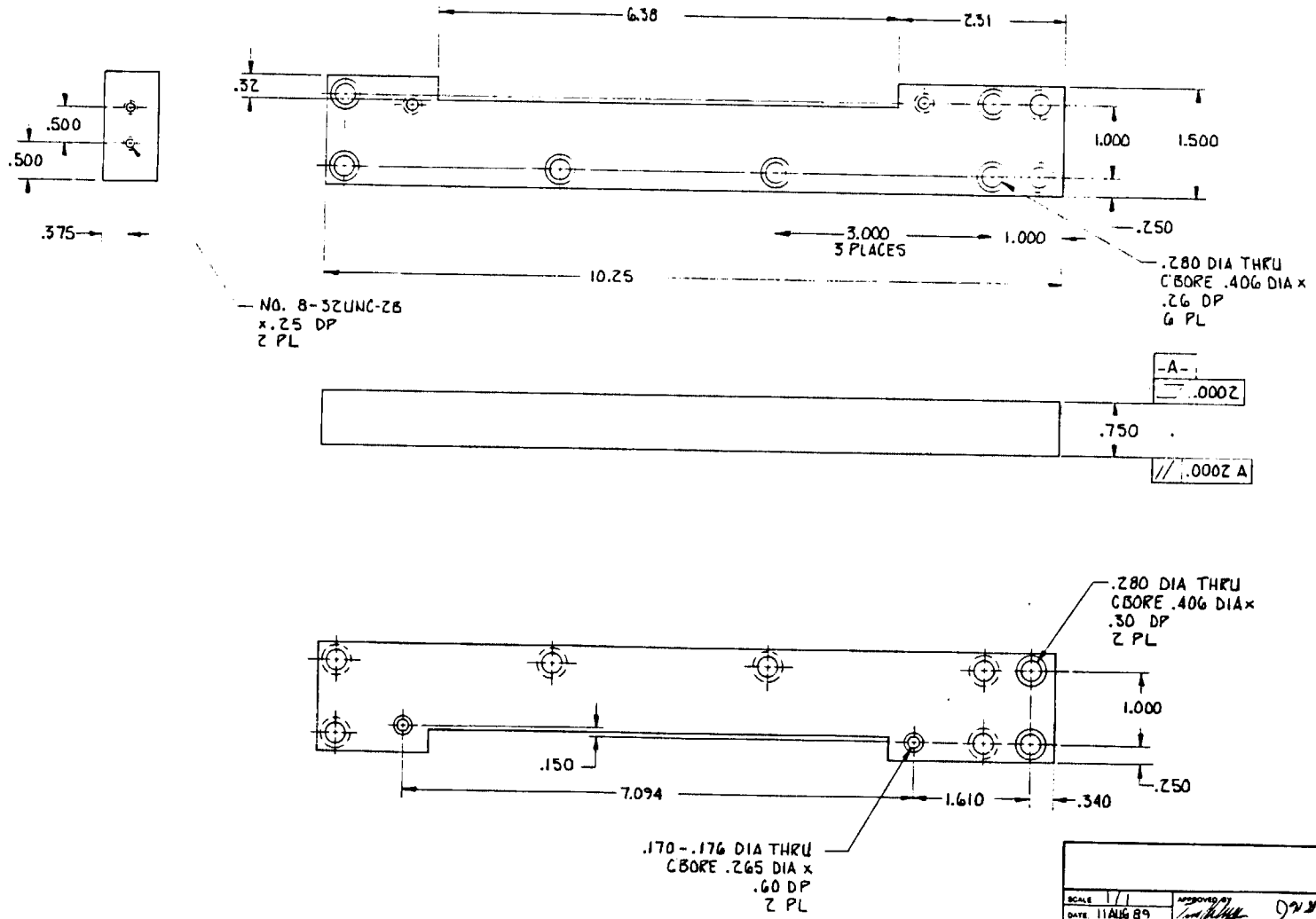
SCALE 1/1
DATE 11 AUG 89
APPROVED
DRAWN BY KMA

MOUNTING BAR, INNER HOLDING FIXTURE

MATL: ALUM ALLOY 6061-T651
FINISH: BLACK HARDCOAT ANODIZE
DRAWING NUMBER 1009-306

NOTES:

1. FINISH WHERE MACHINED 63
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX
3. STRESS RELIEVE PRIOR TO FINAL GRINDING
4. FINAL GRIND AFTER HARDCOAT



TOLERANCES		
X/A	.XX	.XXX
± 1/32	±.01	±.005

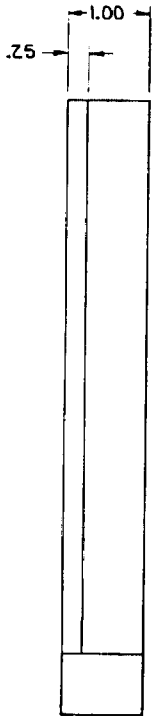
SCALE 1/1	APPROVED BY	DRAWN BY KMA
DATE 11 AUG 89		

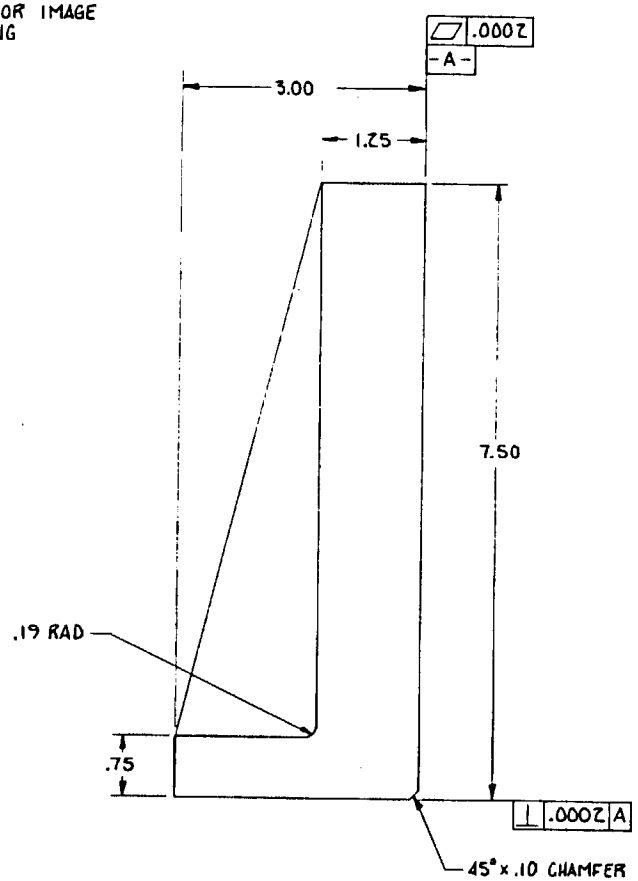
MOUNTING BAR, OUTER HOLDING FIXTURE

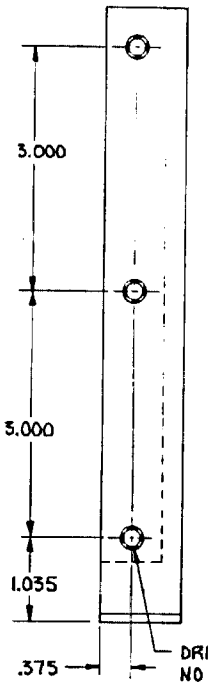
MATL: ALUM ALLOY 6061-T651	FINISH: BLACK HARDCOAT ANODIZE	DRAWING NUMBER 1009-507

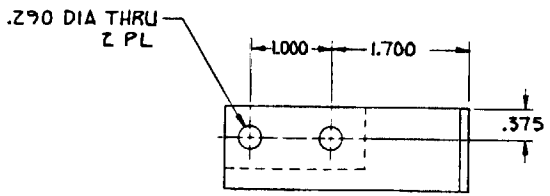
NOTES:

1. FINISH WHERE MACHINED $\sqrt{32}$
2. REMOVE BURRS AND BREAK SHARP EDGES .015
3. DASH 1 MACHINE AS SHOWN, DASH 2 MIRROR IMAGE
4. STRESS RELIEVE PRIOR TO FINAL GRINDING
5. FINAL GRIND AFTER HARDCOAT









TOLERANCES		
X/x	.XX	.XXX
± 1/32	± .01	± .005

SCALE 1/1 | APPROVED BY [signature] 9 2 8 | DRAWN BY KMA

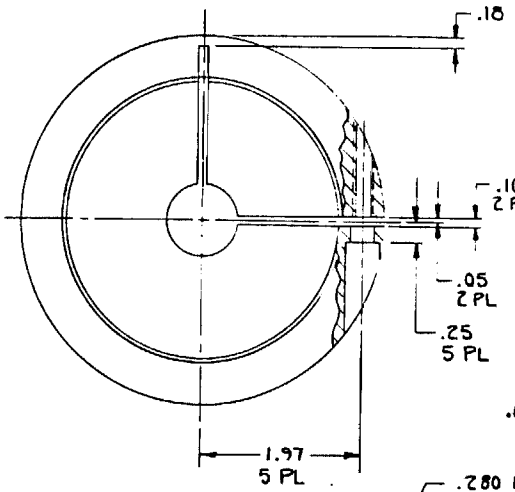
DATE 12OCT89

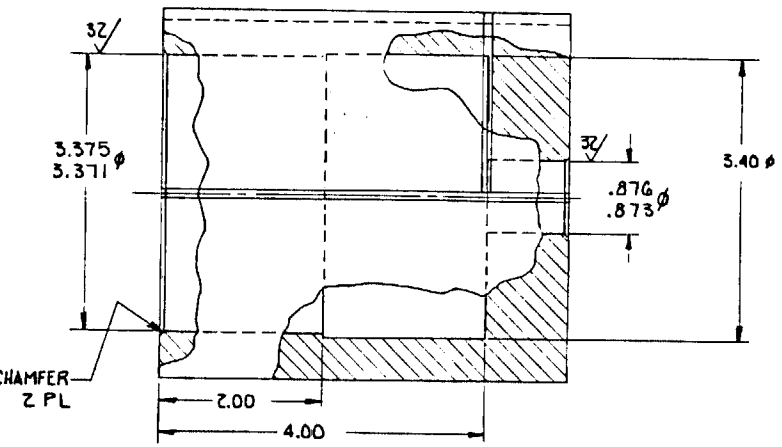
SUPPORT GUSSET

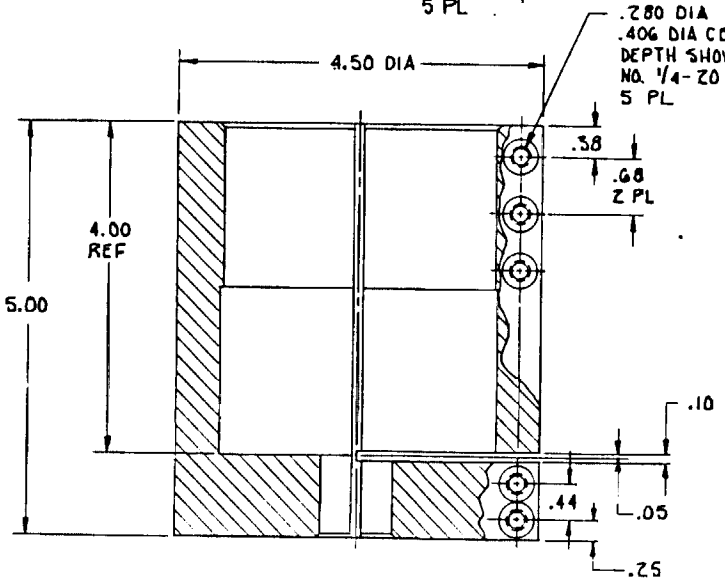
MATL: ALUM ALLOY 6061-T651	FINISH: BLACK HARDCOAT ANODIZE	DRAWING NUMBER 1009-309-X	REV

NOTES:

1. FINISH WHERE MACHINED 63 EXCEPT AS NOTED
2. REMOVE BURRS AND BREAK SHARP EDGES .015 EXCEPT AS NOTED





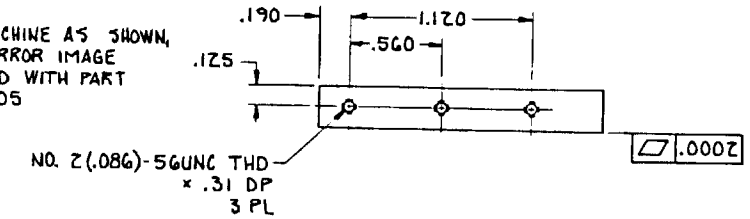


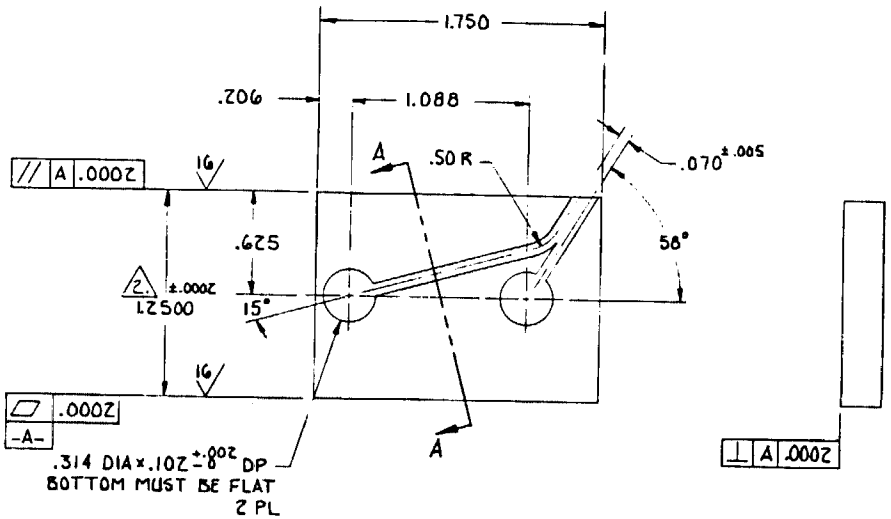
TOLERANCES		
X/X	.XX	.XXX
±1/32	±.01	±.005

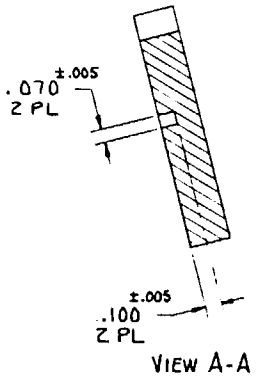
SCALE 1/1	APPROVED BY		DRAWN BY KMA
DATE 20 NOV 89			
ADAPTER, MILLING MACHINE			
MAT'L: ALUM ALLOY 6061-T6	FINISH: NONE		DRAWING NUMBER 1009-310

NOTES:

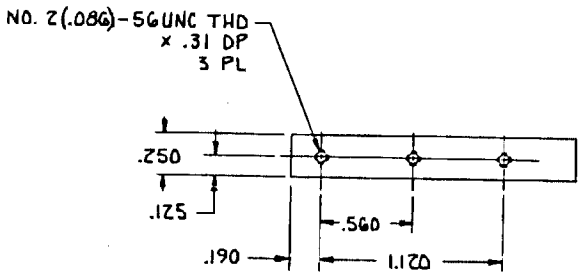
1. DASH 1 MACHINE AS SHOWN, DASH 2 MIRROR IMAGE
2. MATCH GRIND WITH PART NO 1009-205







VIEW A-A

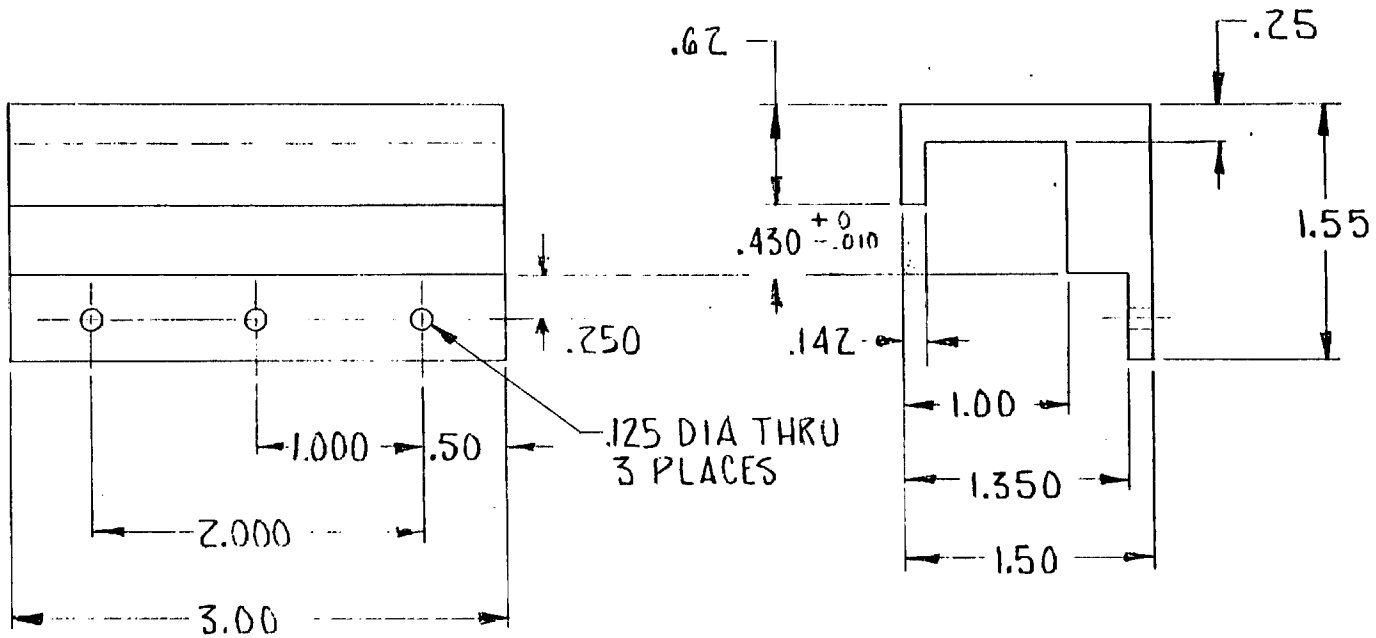


TOLERANCES		
X/x	.XX	.XXX
± 1/32	±.01	±.001

SCALE 2/1 | APPROVED BY DWG | DRAWN BY KMA
DATE 17 JAN 90

SPACER, TRANSPORT-1

MATL MIC G ALUM PLATE | FINISH: BLACK ANODIZE | DRAWING NUMBER 1009-311-X | REV A

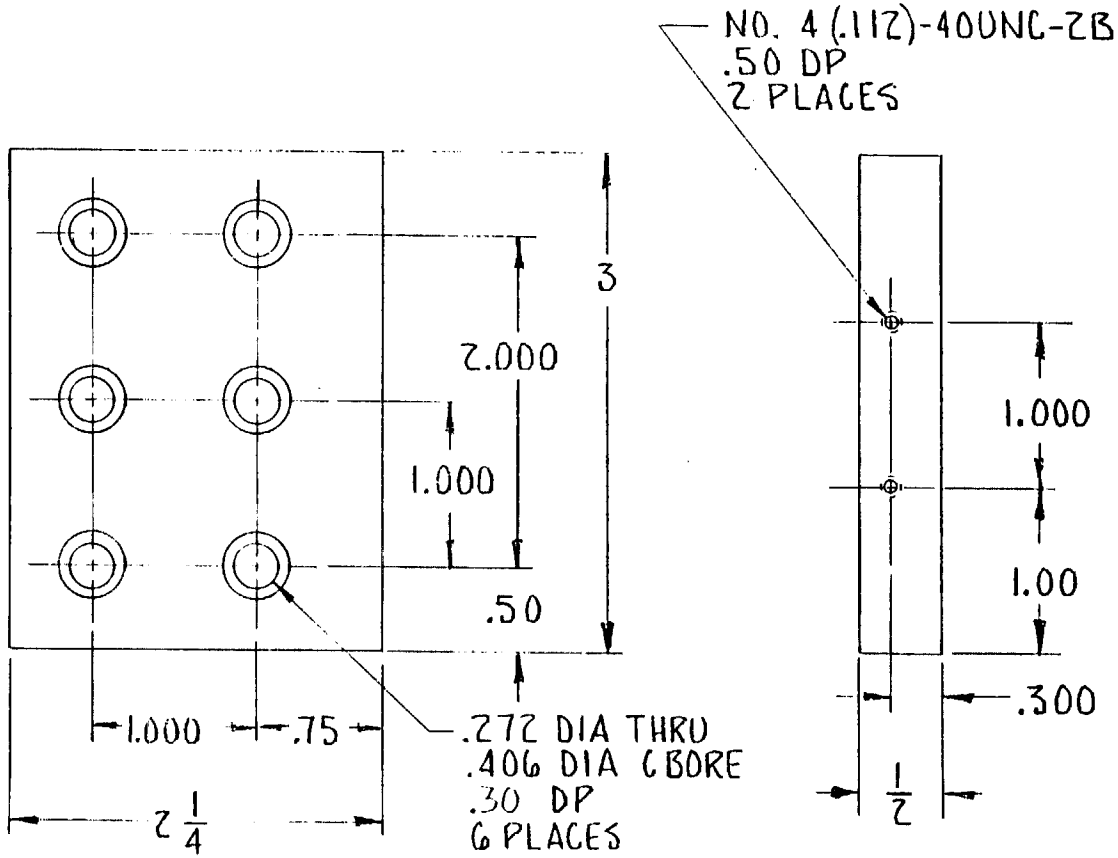


SATCON TECHNOLOGY

SCALE: 1/1	APPROVED BY Tim Hurley	DRAWN BY K AVAKIAN
DATE: 20AUG88		
POLE		
CARPENTER SILICON IRON "C"		DRAWING NUMBER 1009-101

STANDARD TOLERANCES

X/X	.X	.XX	.XXX	.XXXX
±1/32	±.03	±.01	±.005	±.001



SATCON TECHNOLOGY

SCALE: 1/1	APPROVED BY	DRAWN BY
DATE: 20 AUG 88		K AVAKIAN

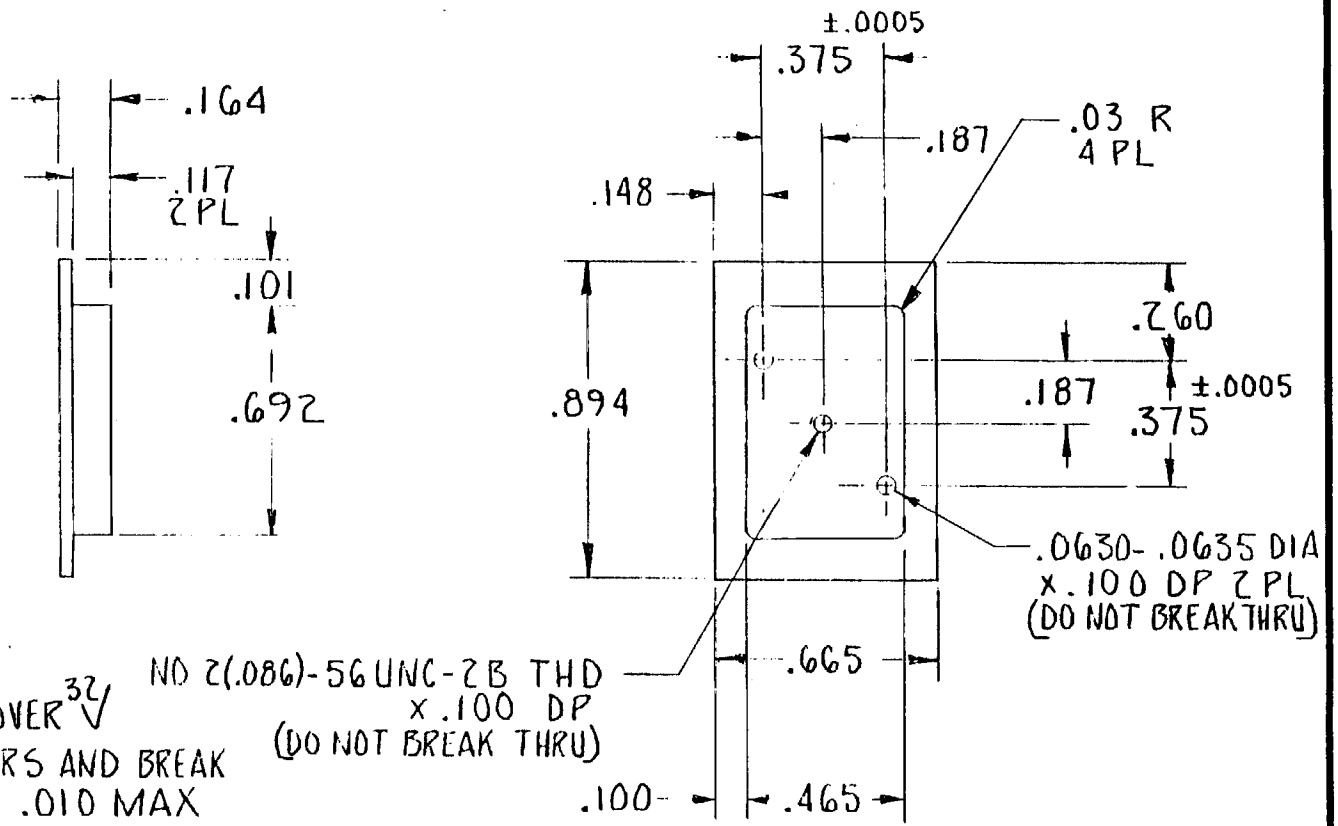
BASE PLATE

ALUM ALLOY 6061-T6

DRAWING NUMBER 1009-102

STANDARD TOLERANCES

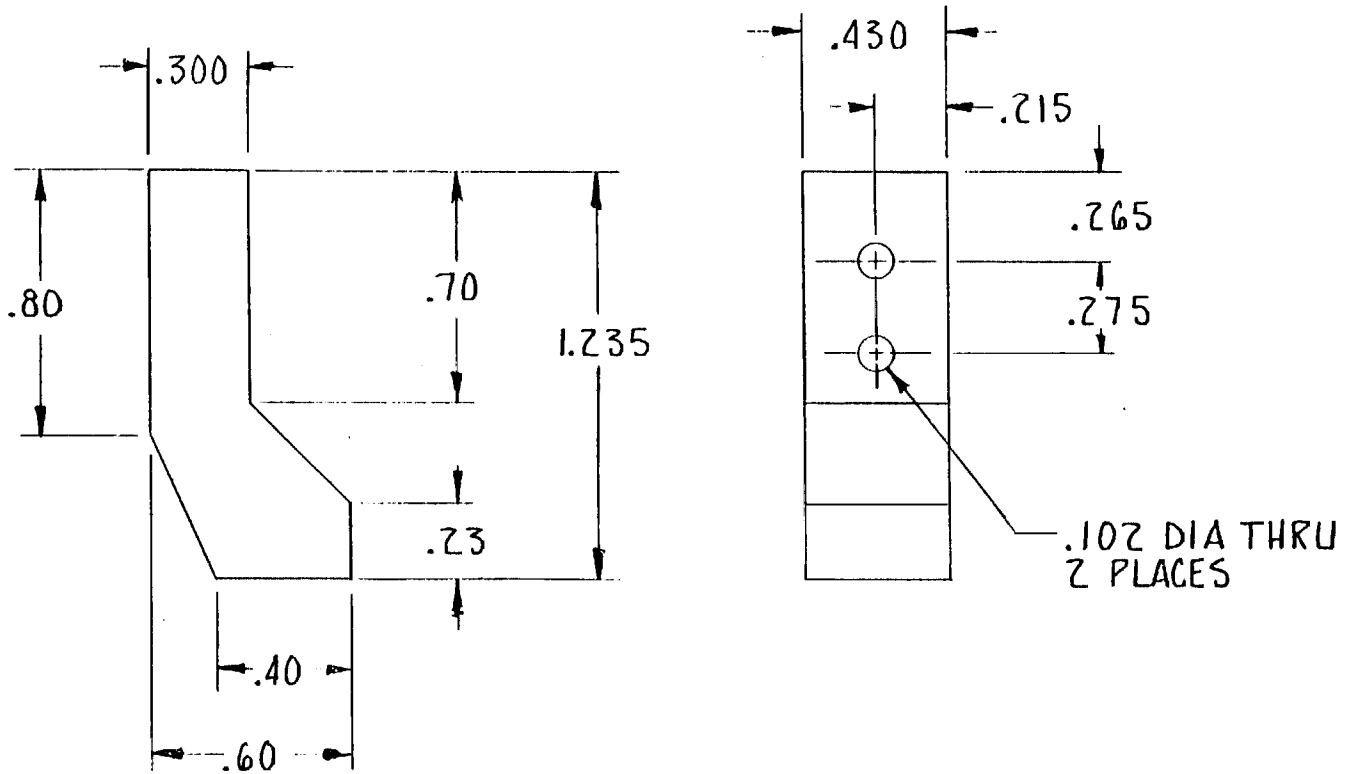
X/X	.X	.XX	.XXX	.XXXX
±1/32	±.03	±.01	±.005	±.001



NOTES:
1. FINISH ALL OVER 32 √
2. REMOVE BURRS AND BREAK SHARP EDGES .010 MAX
3. HEAT TREAT PRIOR TO FINAL FABRICATION PER 1009-106

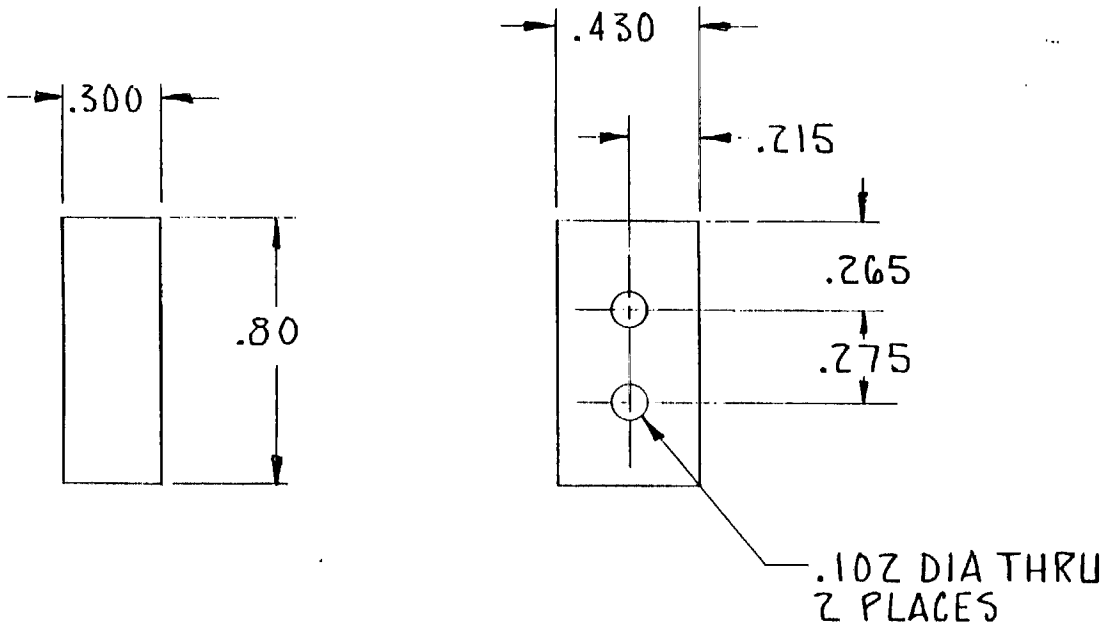
TOLERANCES		
X/X	.XX	.XXX
1/32	.01	.001

SCALE: 2/1	APPROVED BY:	DRAWN BY KMA	
DATE: 11 MAY 89		REVISED	
POLE PIECE, X AXIS			
FINISH: NONE	MATL: HY-MU 80	DRAWING NUMBER 1009-103	REV A



TOLERANCES			
X/X	.XX	.XXX	.XXXX
±1/32	±.01	±.005	±.0010

SCALE: 2/1	APPROVED BY:		DRAWN BY KMA
DATE: 10 JUN 89			REVISED
GUSSET BRACKET			
MATL: ALUM ALLOY 6061-T6	FIN. BLACK ANODIZE		DRAWING NUMBER 1009-104



TOLERANCES			
X/X	.XX	.XXX	.XXXX
± 1/32	± .01	± .005	± .0010

SCALE: 2/1	APPROVED BY:	DRAWN BY KMA
DATE: 10 JUN 89		REVISED

GUSSET SPACER

MATL: ALUM ALLOY 6061 T6	FIN: BLACK ANODIZE	DRAWING NUMBER 1009-105

SatCon Technology Corporation
71 Rogers Street
Cambridge, Massachusetts 02142
(617) 661-0540

Drawing #1009-106

Annealing Instructions for HyMu-80

1) Heat to 2100°F in dry hydrogen atmosphere (dew point below -40 °F)

2) Hold at 2100° F for 3 hours

3) Furnace cool to 700°F at 350-600°F/hour

4) Air cool to room temperature, rate not critical

NOTE: Oil, grease, lacquer, and all other contaminants must be removed before annealing. Individual parts should be separated by inert insulating powder such as magnesium or aluminum oxide during hydrogen anneal to prevent fusion to holding tray or each other.

SatCon Technology Corporation
71 Rogers Street
Cambridge, Massachusetts 02142
(617) 661-0540

Drawing #1009-107

Annealing Instructions for Silicon Iron-C

1) Heat to 1600°F in wet hydrogen atmosphere, rate not critical

2) Hold at 1600° F for 3 hours

3) Furnace cool to 1000°F at 150°F/hour

4) Furnace cool to room temperature, rate not critical

NOTE: Oil, grease, lacquer, and all other contaminants must be removed before annealing. Individual parts should be separated by inert insulating powder such as magnesium or aluminum oxide during hydrogen anneal to prevent fusion to holding tray or each other.

SatCon Technology Corporation
71 Rogers Street
Cambridge, Massachusetts 02142
(617) 661-0540

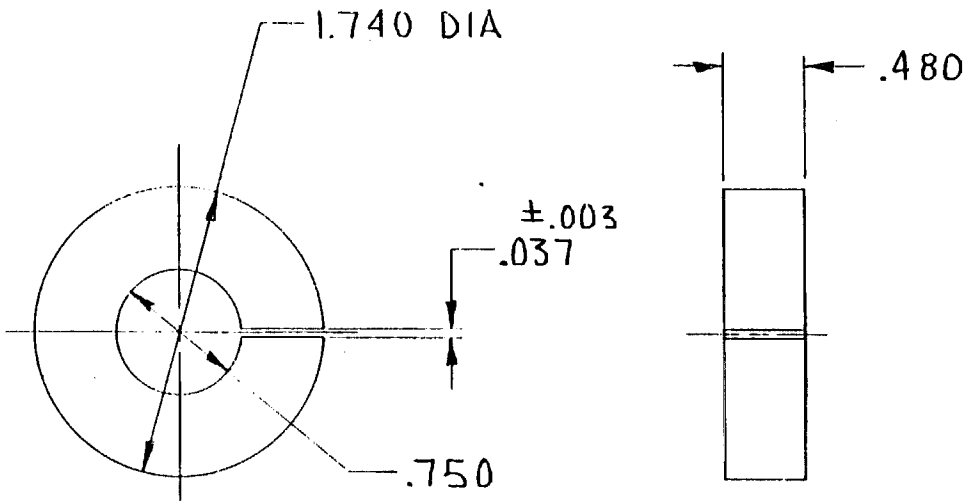
1009-208 SHAFT ASSEMBLY

1) Fabricate piece parts 1009-201, 1009-202, 1009-203 per drawings.

2) Assemble parts on flat reference table, tighten bolts.

3) Drill and ream through pilot holes for press fit with .0625 dowel pin (.090 deep in 1009-203).

4) Match grind 5.600 shaft dimensions per 1009-208 and mark parts for correct re-assembly.

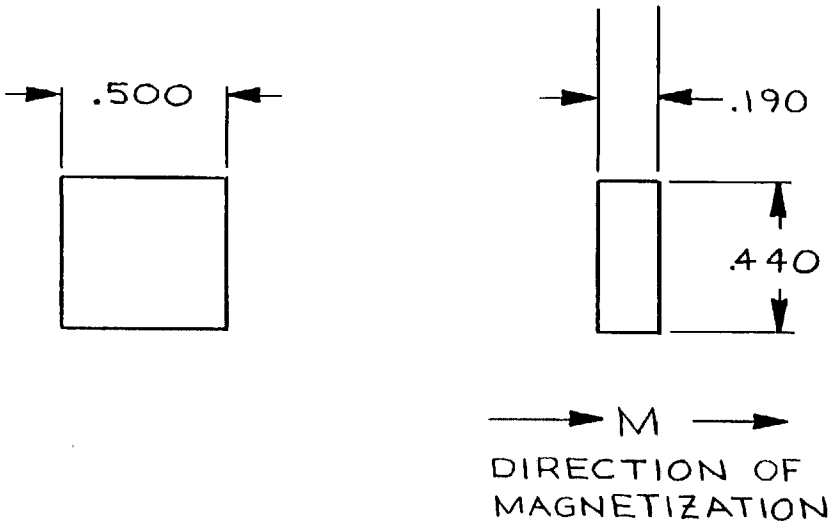


NOTES:

1. FINISH ALL OVER 32 √
2. ALL DIMENSIONS ±.01 EXCEPT AS NOTED
3. HEAT TREAT AFTER MACHINING PER 1009-106

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

SCALE: 1/1	APPROVED BY: T.H. Mackey DH 9/22/89	DRAWN BY KMA
DATE: 10 JUN 89		REVISED
TOROID		
MATL: HY MU 80		DRAWING NUMBER 1009-109



NOTES:

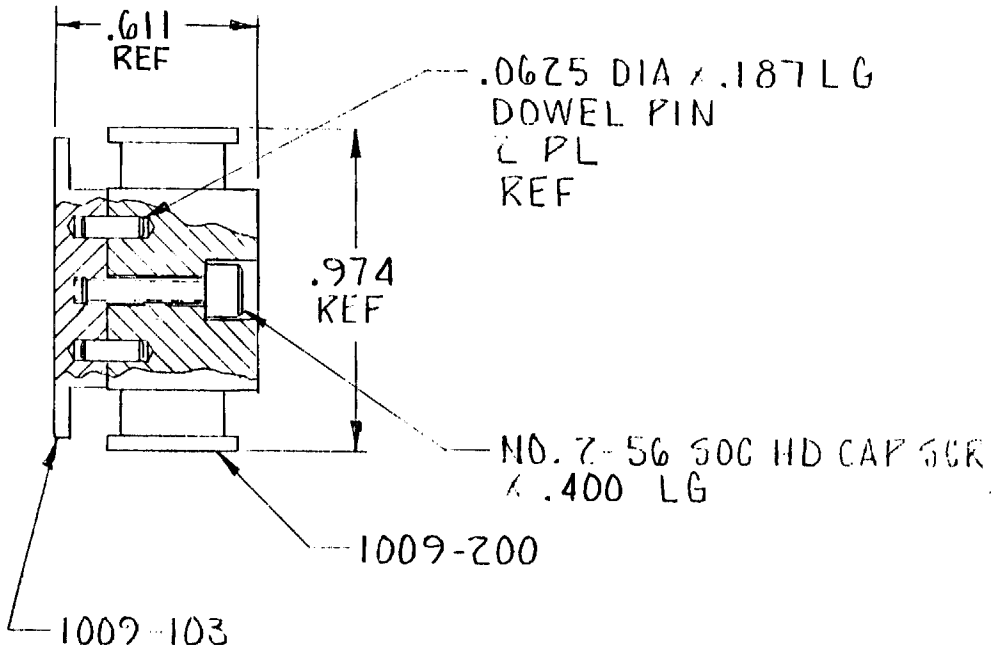
1. UNLESS OTHERWISE SPECIFIED TOLERANCE SHALL BE ±.005

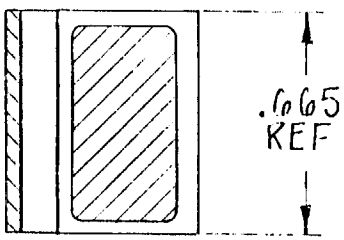
2. MATERIAL ~ SmCo22MGOe FROM PERMAG 96531A

SCALE: 2/1	APPROVED BY:	DRAWN BY J. TYLUS
DATE: 4-23-90		REVISED

BEARING, MAGNET

DRAWING NUMBER
1009-110





SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

NOTES:

1. DWGS -1 AND -2 IDENTICAL EXCEPT FOR LOCATION OF RELIEF
2. REF DIMS APPLY BEFORE FINAL ASSY PER DWG. NO 1009-207-A

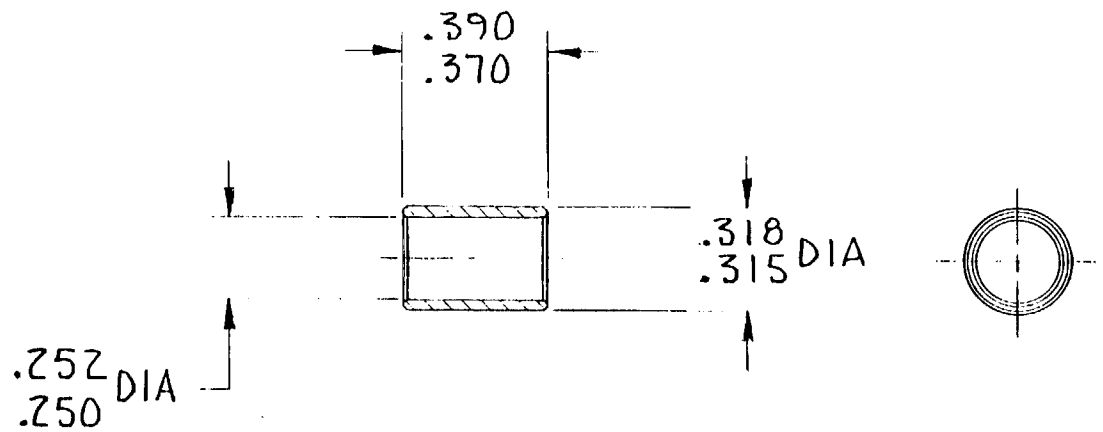
SCALE: 2/1	APPROVED BY:	DRAWN BY KMA
DATE: 14 JUN 89		REVISED

POLE PIECE ASSEMBLY

DRAWING NUMBER	REV
1009-111-X	B

NOTES:

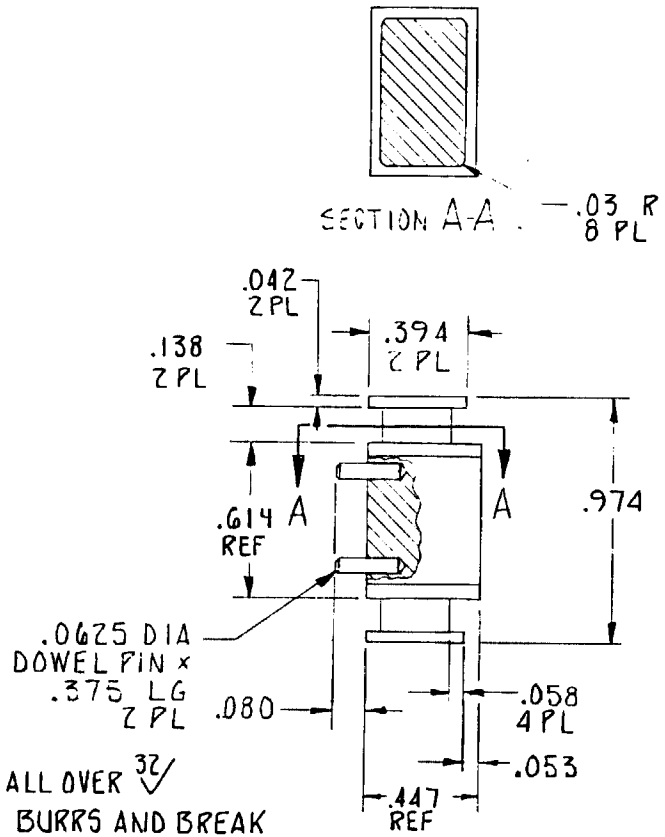
1. REMOVE FEATHER EDGES .010

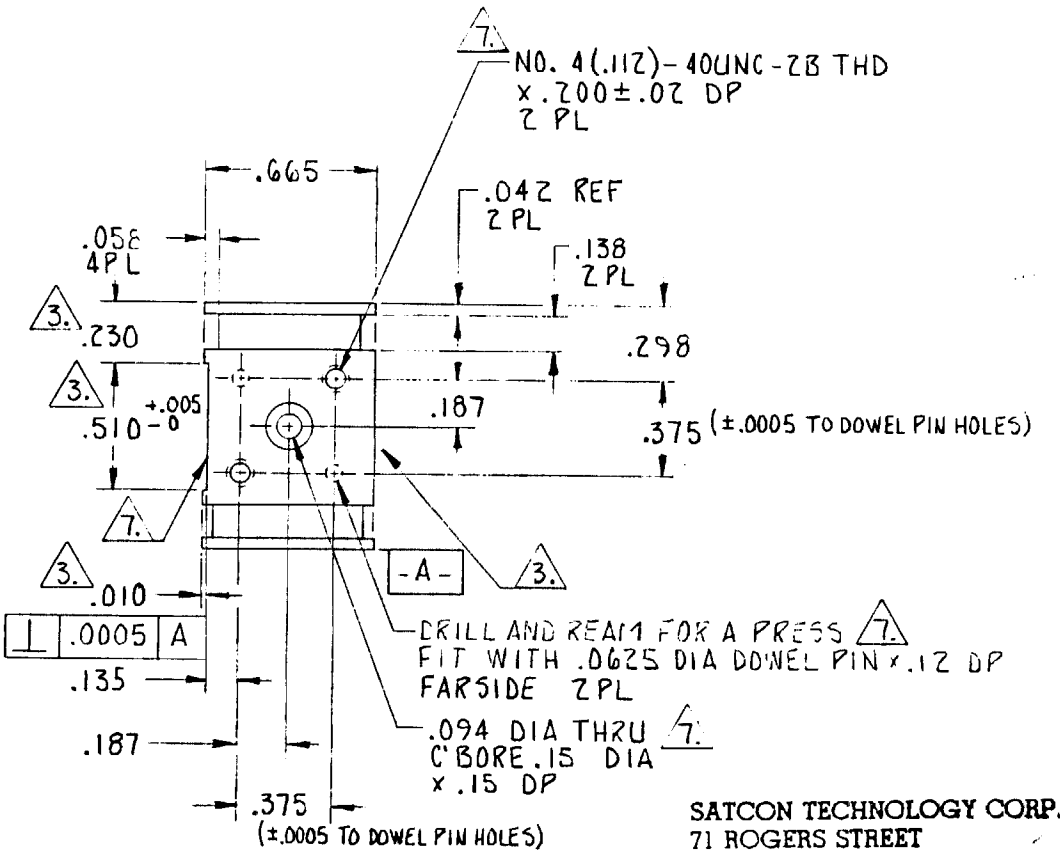


SCALE: 2/1	APPROVED BY:	DRAWN BY KMA
DATE: 19JUL89		REVISED

BUSHING, FORCE SENSOR TEST FIXTURE

MATL: DELRIN	DRAWING NUMBER 1009-112





NOTES:

1. FINISH ALL OVER 32
2. REMOVE BURRS AND BREAK SHARP EDGES .010 MAX
3. DASH 1, MACHINE AS SHOWN. DASH 2, RELIEF TO BE MACHINED ON OPPOSITE SIDE
5. HEAT TREAT PER 1009-106 PRIOR TO FINAL FABRICATION
6. SEE DWG 1009-207 FOR FINAL DIMENSIONS AFTER ASSEMBLY
7. ALL HOLES TO BE LOCATED FROM INDICATED SURFACE OF RELIEF, DASH 1 AND DASH 2

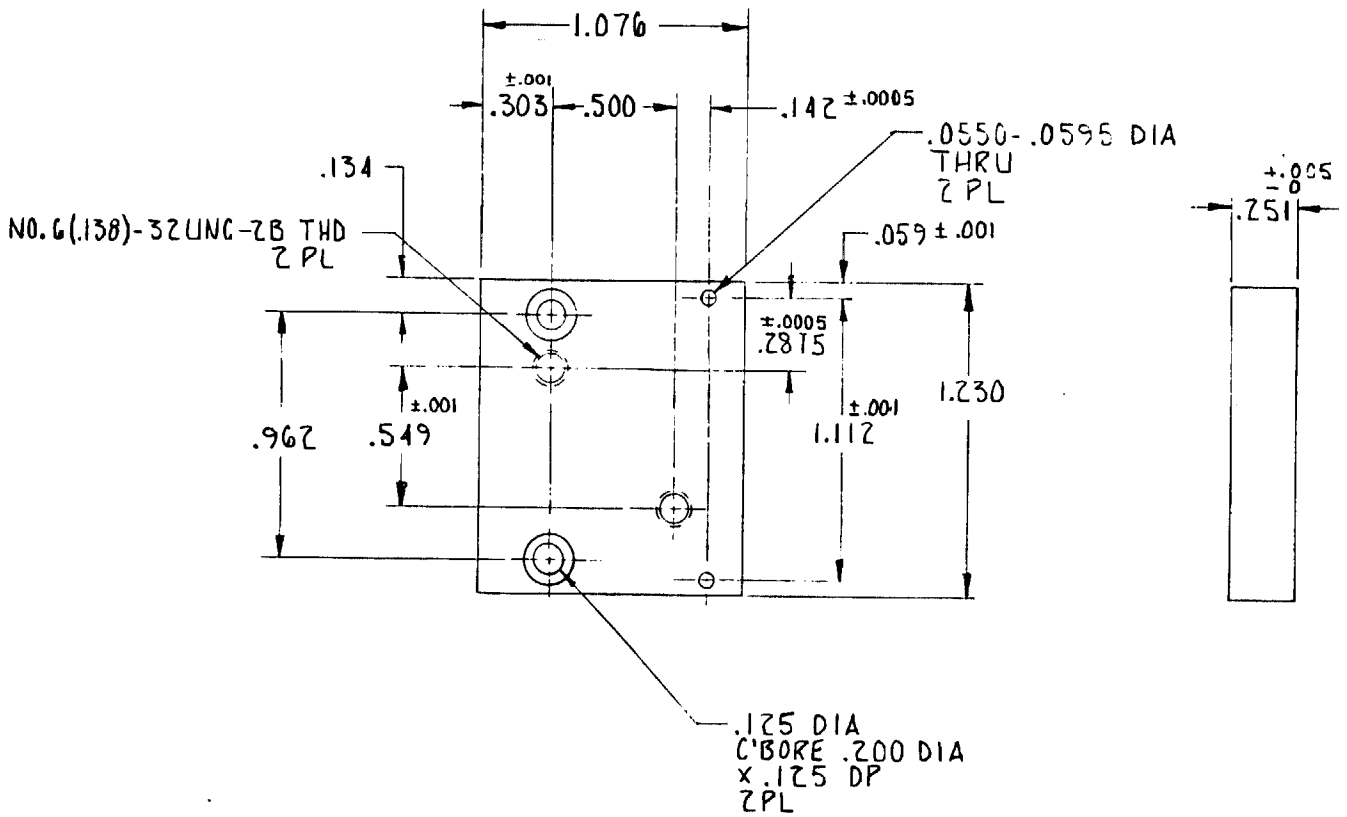
SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

TOLERANCES		
X/X	.XX	.XXX
±1/32	±.01	±.001

SCALE: 2/1
DATE: 11MAY89
APPROVED BY: Tim Hankey
DRAWN BY: KMA

POLE PIECE, Z AXIS

FINISH: NONE | MATL: HY-MU 80 | DRAWING NUMBER: 1009-200 | REV: A



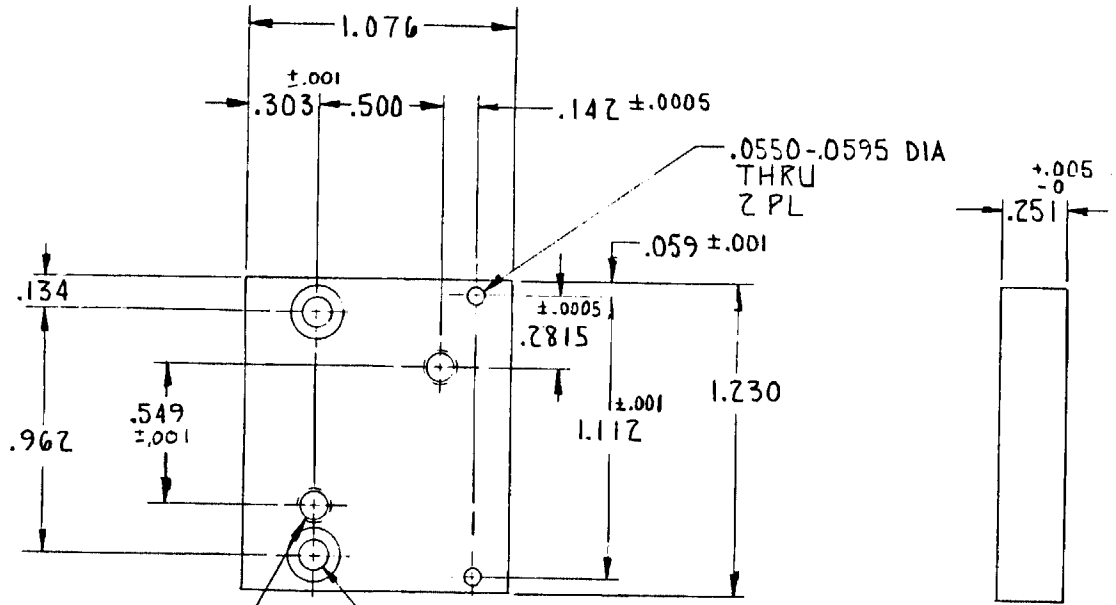
NOTES:

1. FINISH ALL OVER 32 V
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX
3. HEAT TREAT PRIOR TO FINAL MACHINING PER DWG 1009-107

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

TOLERANCES		
X/X	.XX	.XXX
1/32	.01	.005

SCALE: 2/1	APPROVED BY Tim Hawkey T/H 9/28	DRAWN BY KMA
DATE: 11MAY89		
PLATE, ADAPTER, OUTER		
FINISH: NONE	MATL: HY-MU 80	DRAWING NUMBER 1009-201



NOTES:

1. FINISH ALL OVER 32
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX
3. HEAT TREAT PRIOR TO FINAL MACHINING PER DWG 1009-107

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

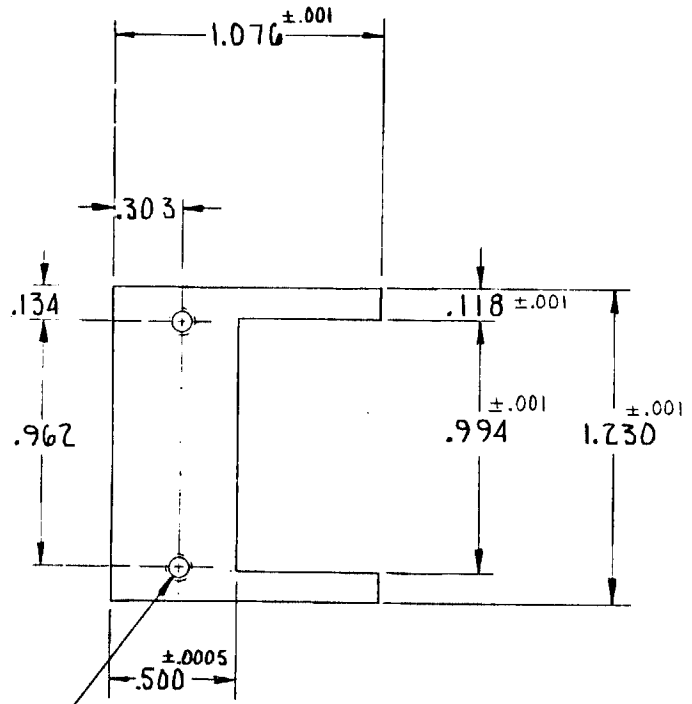
TOLERANCES		
X/X	.XX	.XXX
1/32	.01	.005

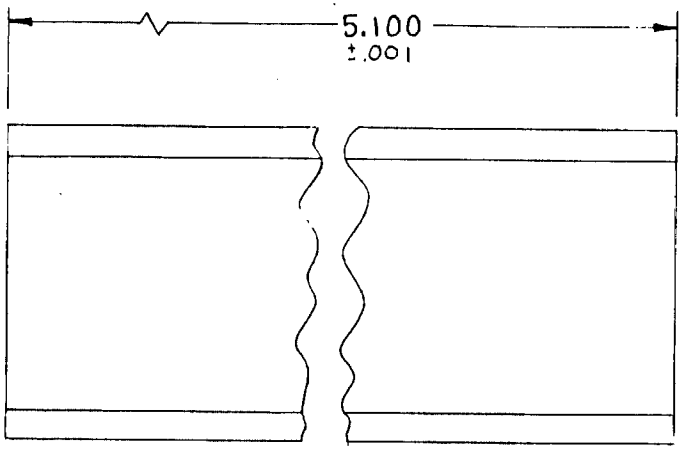
SCALE: 2/1 | APPROVED BY: Tim Hawkey TJH 2/89 | DRAWN BY: KMA

DATE: 11 MAY 89

PLATE, ADAPTER, INNER

FINISH: NONE | MATL: HY-MU 80 | DRAWING NUMBER: 1009-202





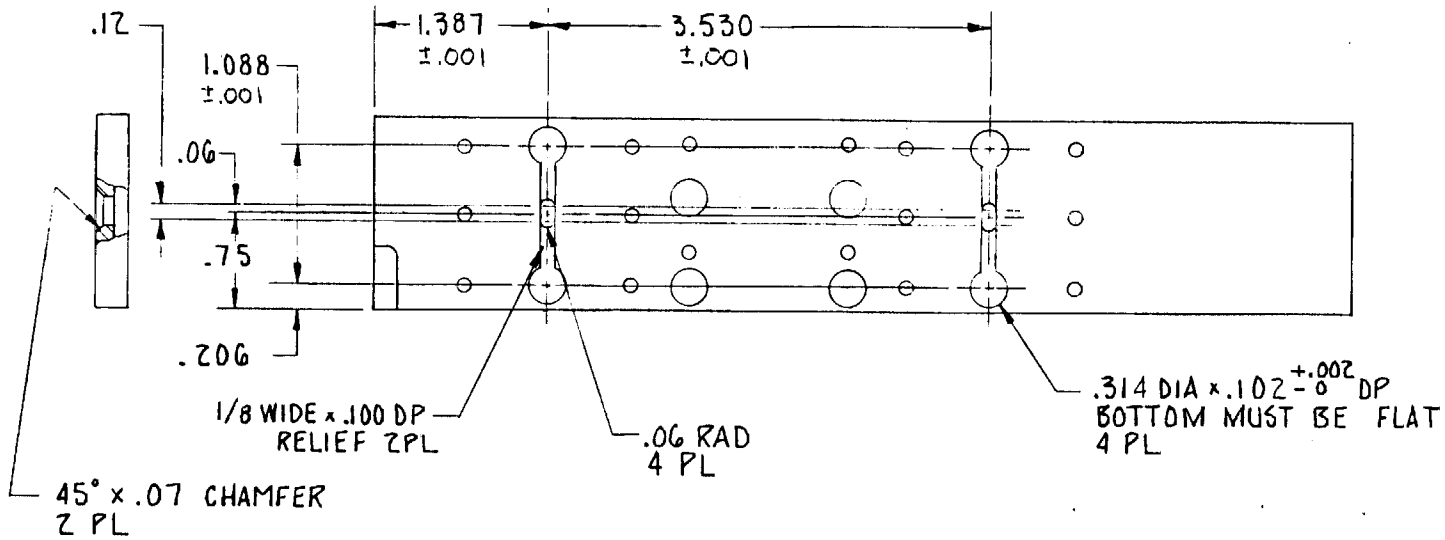
NOTES:

1. FINISH ALL OVER 32
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX
3. SEE DWG 1009-300 FOR FINAL DIMENSIONS
4. HEAT TREAT PRIOR TO FINAL MACHINING PER DWG 1009-107

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

TOLERANCES		
X/X	.XX	.XXX
1/32	.01	.005

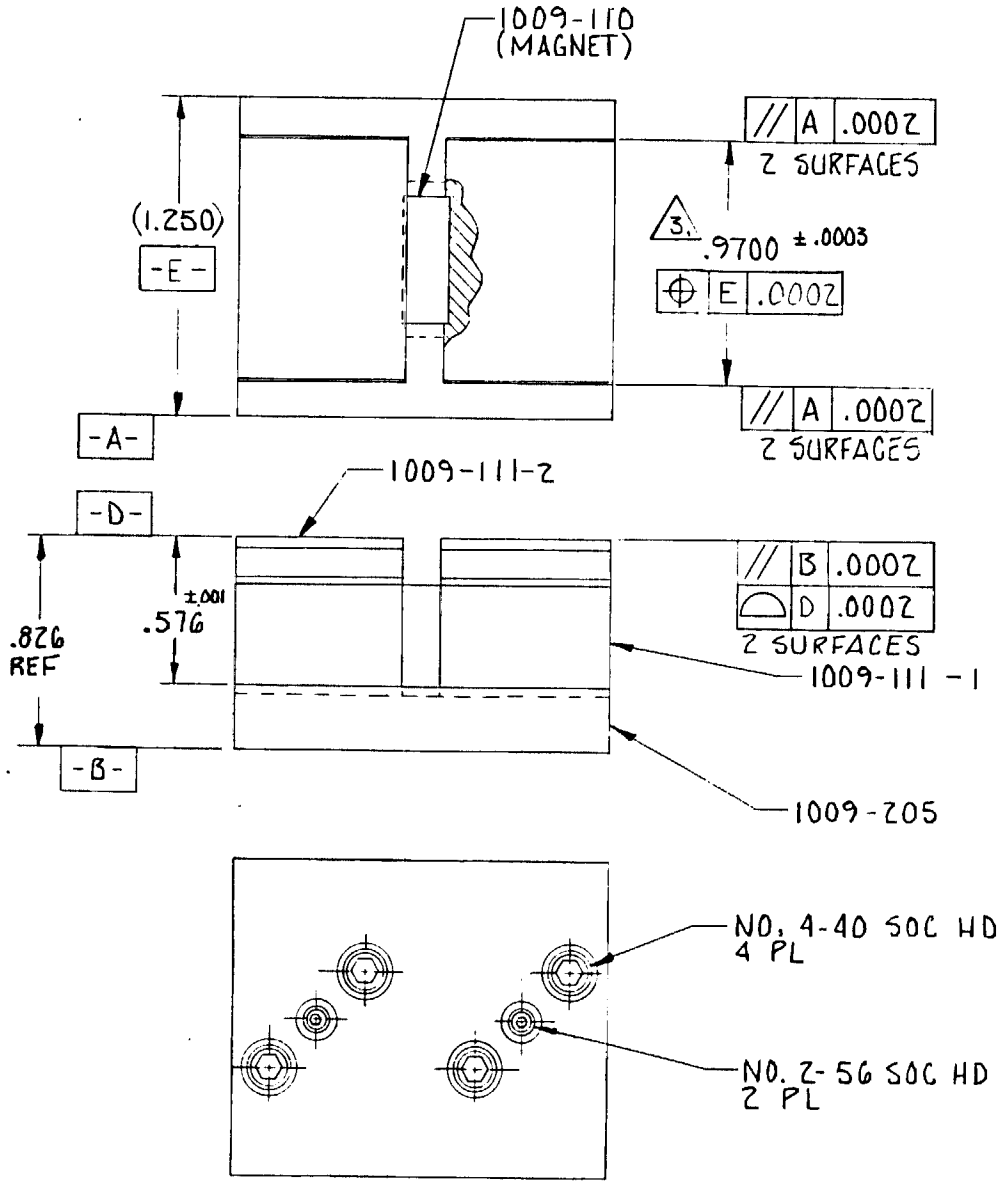
SCALE: 2/1	APPROVED BY Tim Hawkey TH 5/28	DRAWN BY KMA
DATE: 11 MAY 89		
SHAFT, MAGNETIC BEARING		
FINISH: NONE	MATL: HY-MU 80	DRAWING NUMBER 1009-203



SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

SCALE: 1/1	APPROVED BY Tim Hawkey TH 8/22/89		DRAWN BY KMA	
DATE: 11 MAY 89				
PLATE, UPPER TRANSPORT (MODIFIED)				
FINISH: NONE	MATL: MAKE FROM: RCA DWG NO. 8681532		DRAWING NUMBER 1009-204	

TOLERANCES		
x/x	.XX	.XXX
1/32	.01	.005



NOTES:

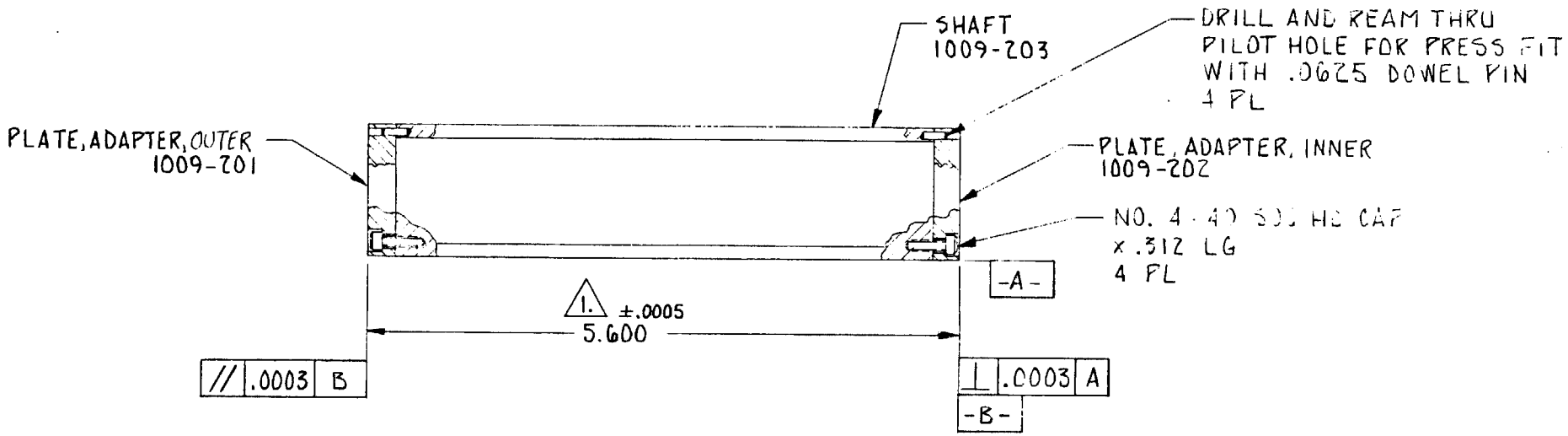
1. PARTS SHALL BE DISASSEMBLED TO WIND CONDUCTORS ONTO POLE PIECE. AFTER REASSEMBLY PARTS SHALL MEET SPECIFIED TOLERANCES
2. SEE ATTACHED SHEET FOR ASSEMBLY PROCEDURES
3. TO ACHIEVE .9700 DIM REMOVE EQUAL MATERIAL FROM BOTH SIDES

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

SCALE: 2/1	APPROVED BY Tim Hawkey	DRAWN BY KMA
DATE: 20MAY 89		

MAGNETIC BEARING ASSEMBLY

DRAWING NUMBER	REV
1009-207	B



NOTE:

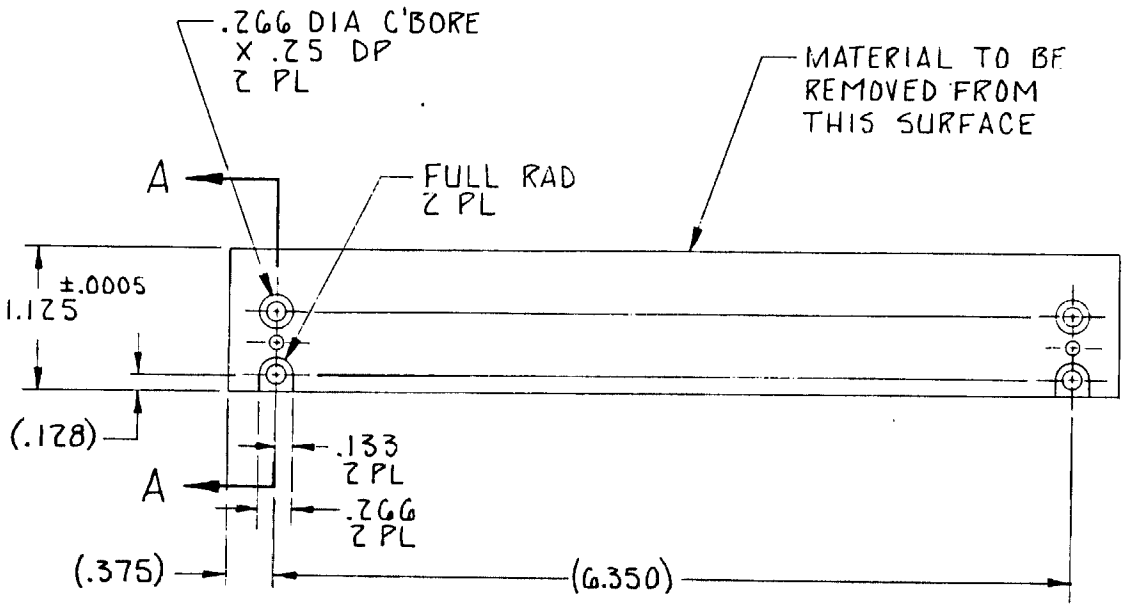
1. DASH 1 AND DASH 2 TO BE MATCH GROUND

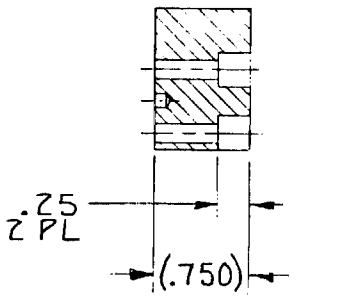
SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

SCALE: 1/1	APPROVED BY Tim Hawkey TJH 6/23/89	DRAWN BY KMA
DATE: 23MAY89		

SHAFT ASSEMBLY

DRAWING NUMBER 1009-208-X





SECTION A-A

NOTES:

1. THIS PART TO BE MATCH GROUND WITH 1009-210, 1009-211, 1009-212 AND 1009-213

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

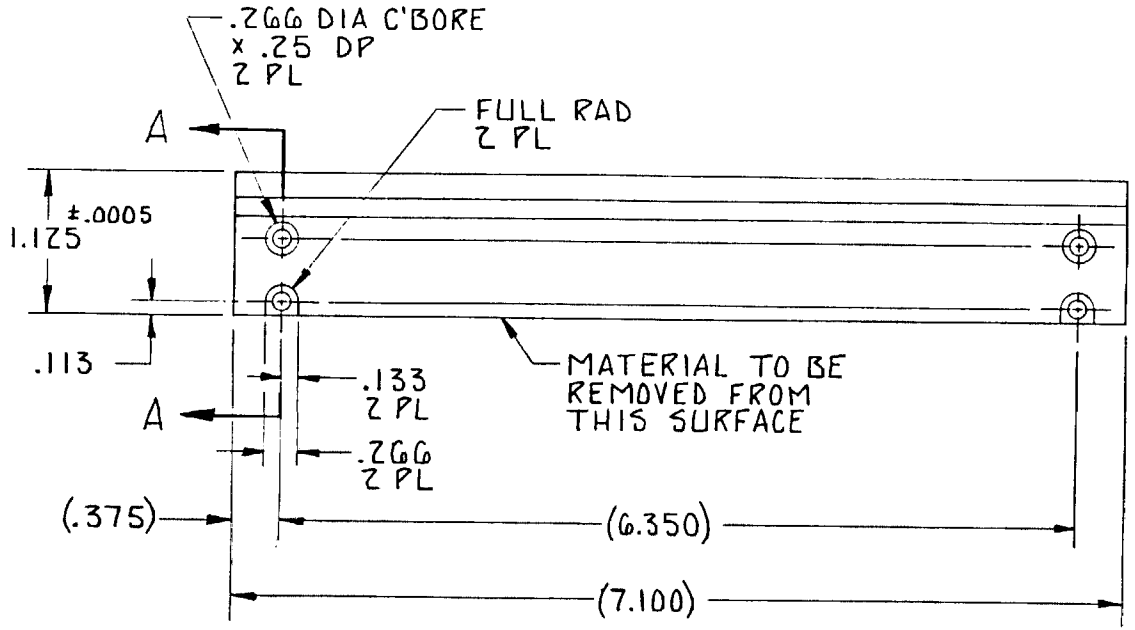
TOLERANCES		
X/x	.XX	.XXX
—	±.01	±.005

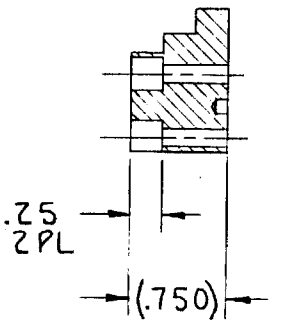
SCALE: 1/1	APPROVED BY Tim Hawkey	DRAWN BY KMA
DATE: 20 JUN 89		

BAR, UPPER- FLUX RETURN

MATL: MAKE FROM RCA NO. 8686071-1

DRAWING NUMBER 1009-209





SECTION A-A

NOTES:

1. THIS PART IS TO BE MATCH GROUND WITH 1009-209, 1009-211, 1009-212 AND 1009-213

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

TOLERANCE		
X/X	.XX	.XXX
—	±.01	±.005

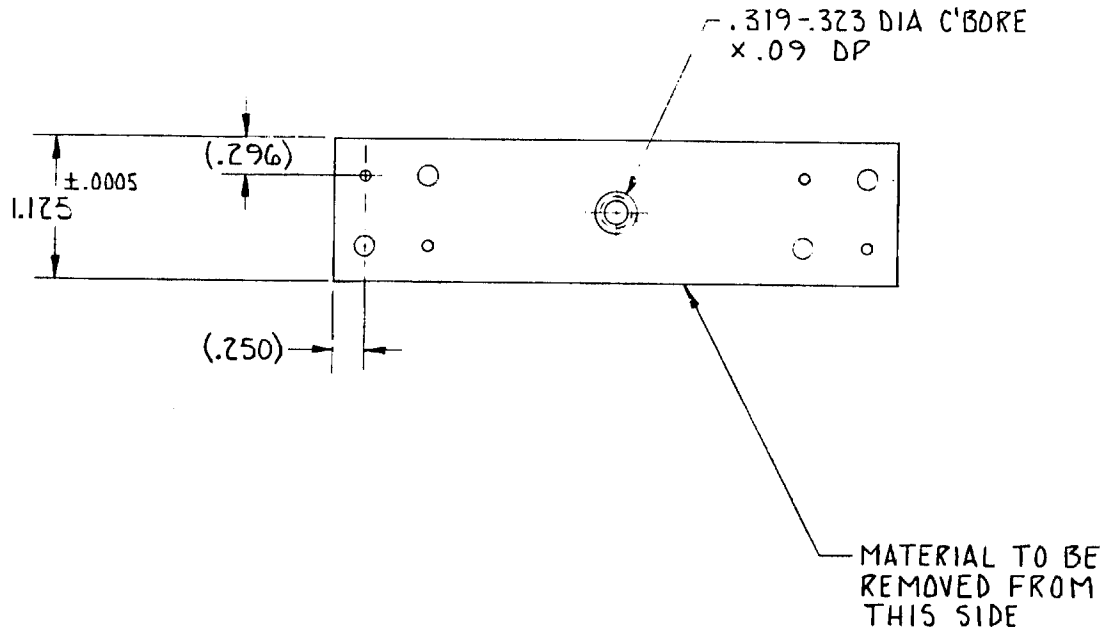
SCALE: 1/1 | APPROVED BY: Tim Hawkey 11/4 9/28 | DRAWN BY: KMA

DATE: 20JUN89

BAR, LOWER-FLUX RETURN

MATL: MAKE FROM RCA PART NO. 8686071-2

DRAWING NUMBER: 1009-210



NOTES

1. THIS PART TO BE MATCH GROUND WITH 1009-209, 1009-210, 1009-212 AND 1009-213

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

TOLERANCES		
X/x	.XX	.XXX
—	±.01	±.005

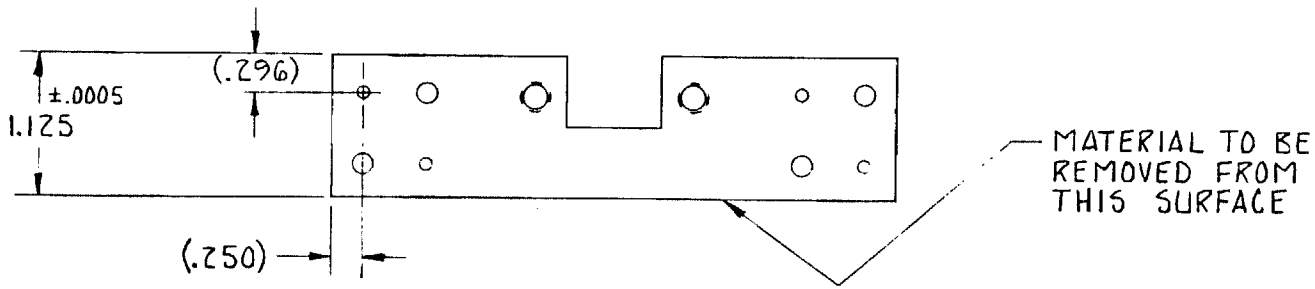
SCALE: 1/1 | APPROVED BY: Tim Hawkey TJH-8/28 | DRAWN BY: KMA

DATE: 20JUN89

SUPPORT, INNER FRAME

MATL: MAKE FROM RCA PART NO. 8382783-1

DRAWING NUMBER: 1009-211



NOTES:

1. THIS PART TO BE MATCH GROUND WITH 1009-209, 1009-210, 1009-211 AND 1009-213

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

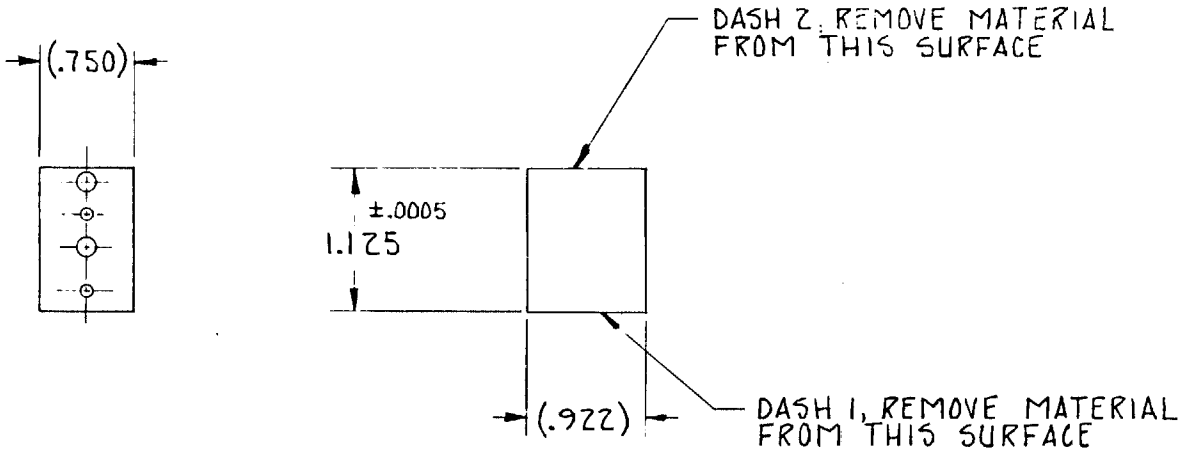
SCALE: 1/1	APPROVED BY Tim Hawkey TH 6/22	DRAWN BY KMA
DATE: 20 JUN 89		

TOLERANCES		
X/X	.XX	.XXX
—	± .01	±.005

SUPPORT, OUTER FRAME

MATL: MAKE FROM RCA PART NO. 8382783-2

DRAWING NUMBER 1009-212



NOTES:

1. THIS PART TO BE MATCH GROUND WITH 1009-209, 1009-210, 1009-211 AND 1009-212

SATCON TECHNOLOGY CORP.
71 ROGERS STREET
CAMBRIDGE, MA 02142

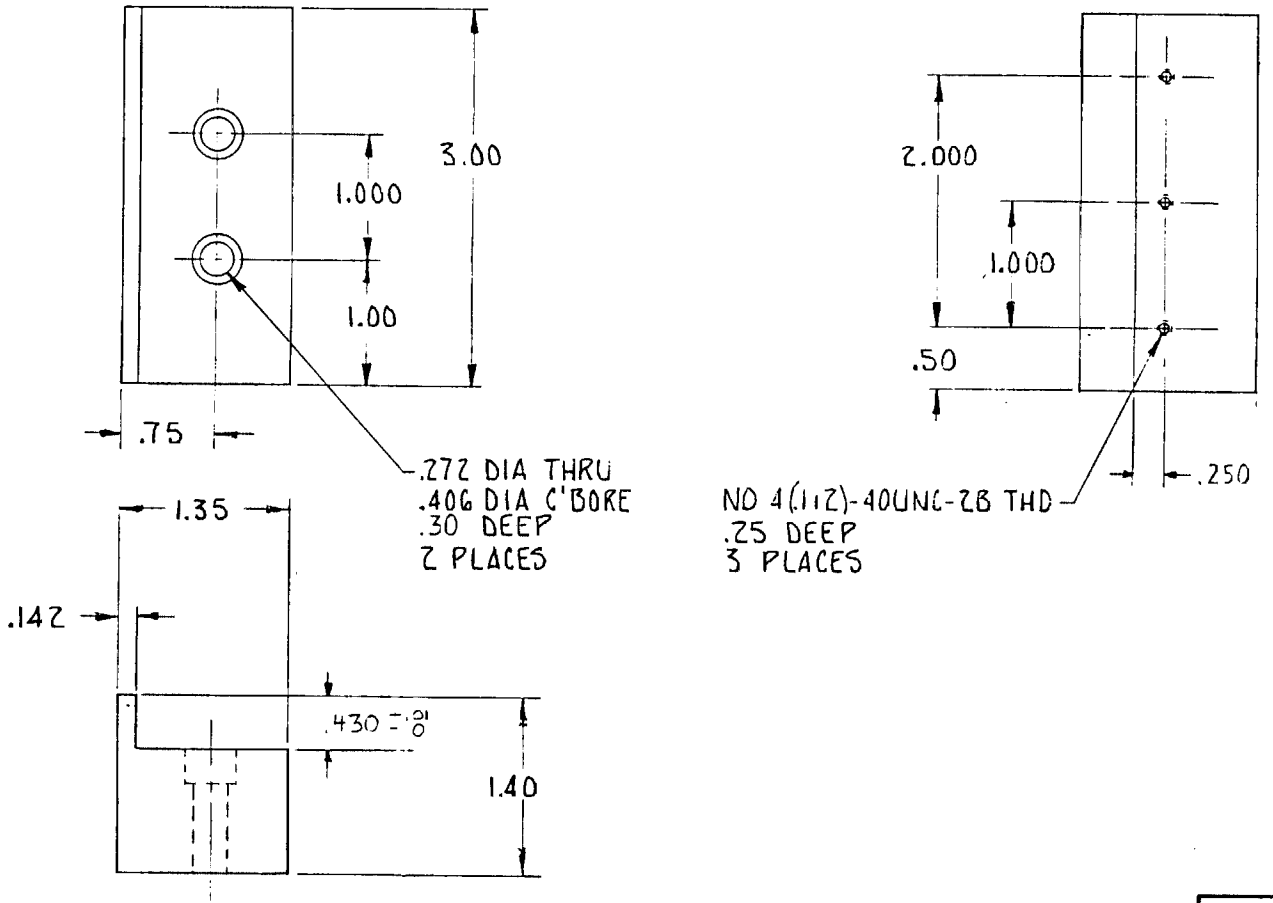
SCALE: 1/1	APPROVED BY Tim Hawke 21 JUN 89	DRAWN BY KMA
DATE: 21JUN 89		

TOLERANCES		
X/x	.XX	.XXX
—	±.01	±.005

SPACER, FLUX RETURN

MATL: MAKE FROM RCA PART NO. 8382783-3

DRAWING NUMBER 1009-213-X



STANDARD TOLERANCES				
X/X	.X	.XX	.XXX	.XXXX
± 1/32	± .03	± .01	± .005	± .001

SATCON TECHNOLOGY

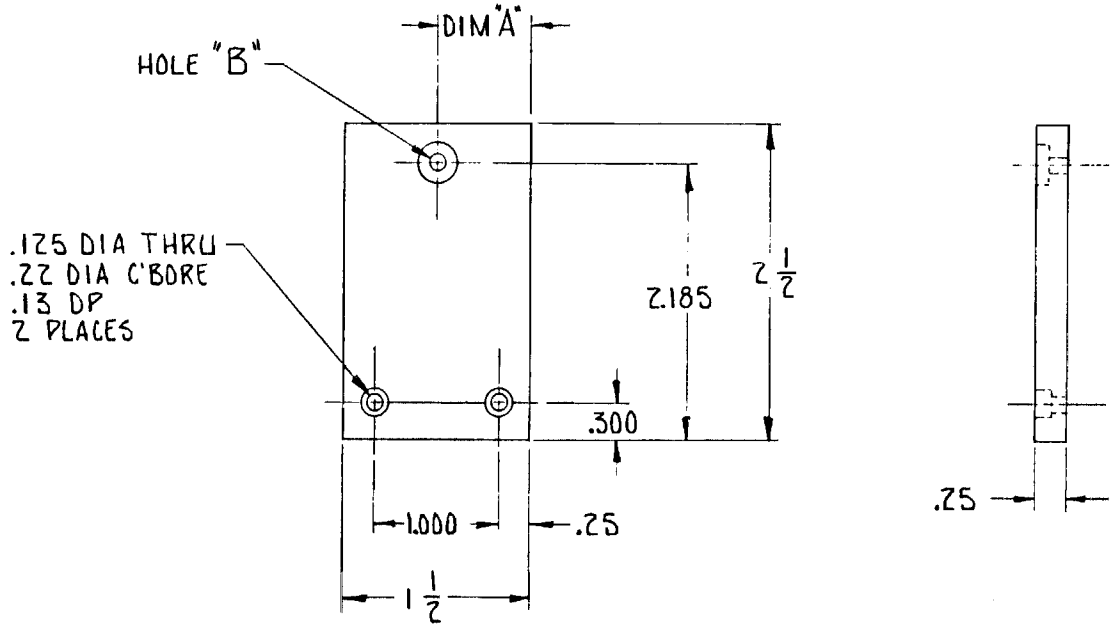
SCALE: 1/1	APPROVED BY	DRAWN BY
DATE: 20 AUG 88	Tim Vaughn	K AVAKIAN

TARGET

CARPENTER SILICON IRON "C"

DRAWING NUMBER 1009-214

-X	DIM "A"	HOLE "B"
1	.750	NOTE 1
2	.174	NOTE 1
3	.750	NOTE 2
4	.174	NOTE 2



NOTES:

1. HOLE "B" .125 DIA THRU
   C'BORE .312 DIA x .100 DP
   REAM .319 DIA
   FLOOR HOLE "B" MUST BE FLAT
2. HOLE "B" .125 DIA THRU
   C'BORE .219 DIA x .100 DP
   REAM .225 DIA
   FLOOR HOLE "B" MUST BE FLAT

STANDARD TOLERANCES				
X/X	.X	.XX	.XXX	.XXXX
±1/32	±.03	±.01	±.005	±.001

SATCON TECHNOLOGY

SCALE: 1/1	APPROVED BY	DRAWN BY
DATE: 30AUG88		K AVAKIAN

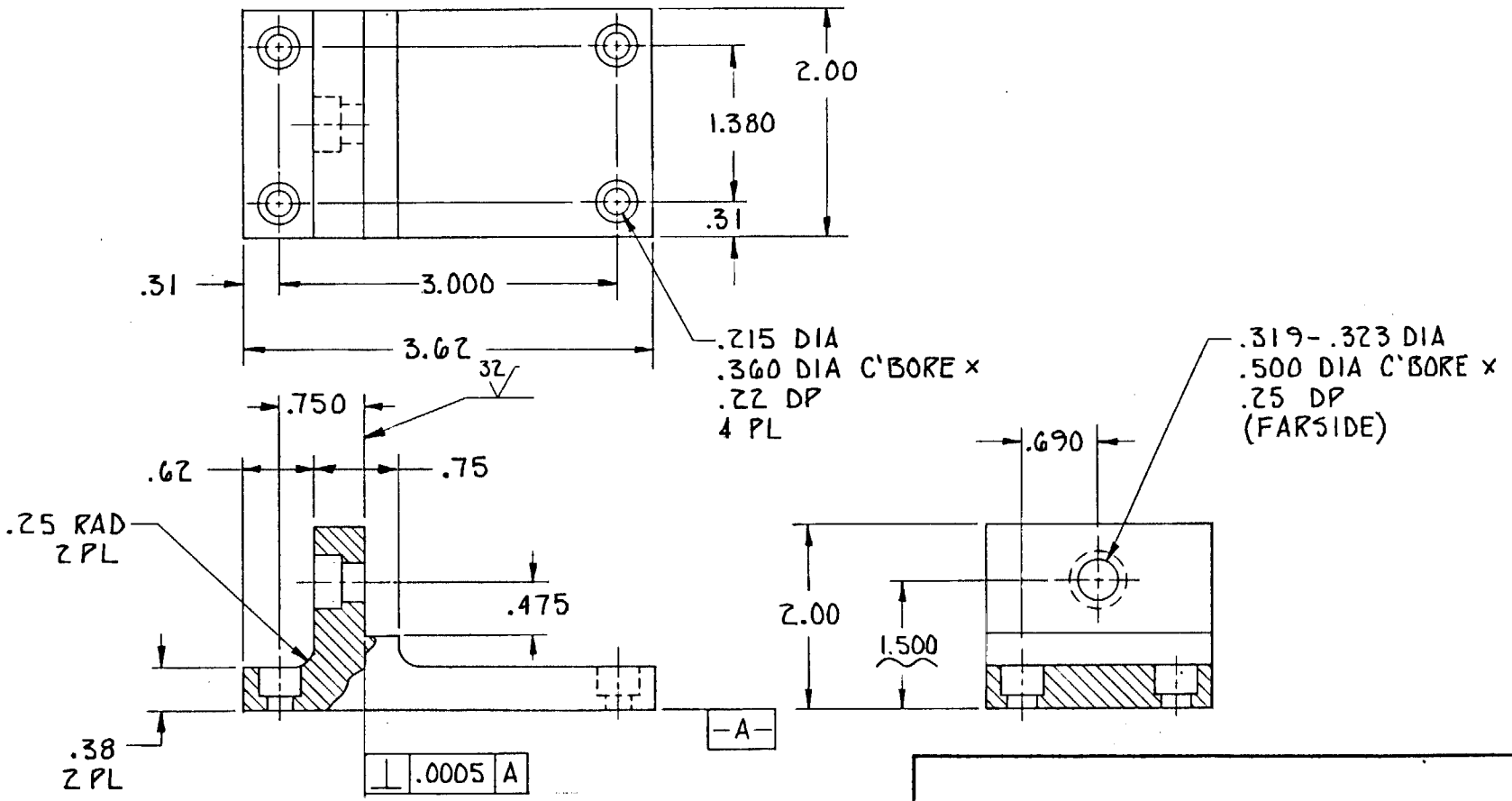
SENSOR MOUNT

ALUM ALLOY 6061-T6

DRAWING NUMBER 1009-215-X

NOTES:

1. FINISH ALL OVER 63 EXCEPT AS NOTED
2. REMOVE BURRS AND BREAK SHARP EDGES .015



TOLERANCES		
X/x	.XX	.XXX
±1/32	±.01	±.005

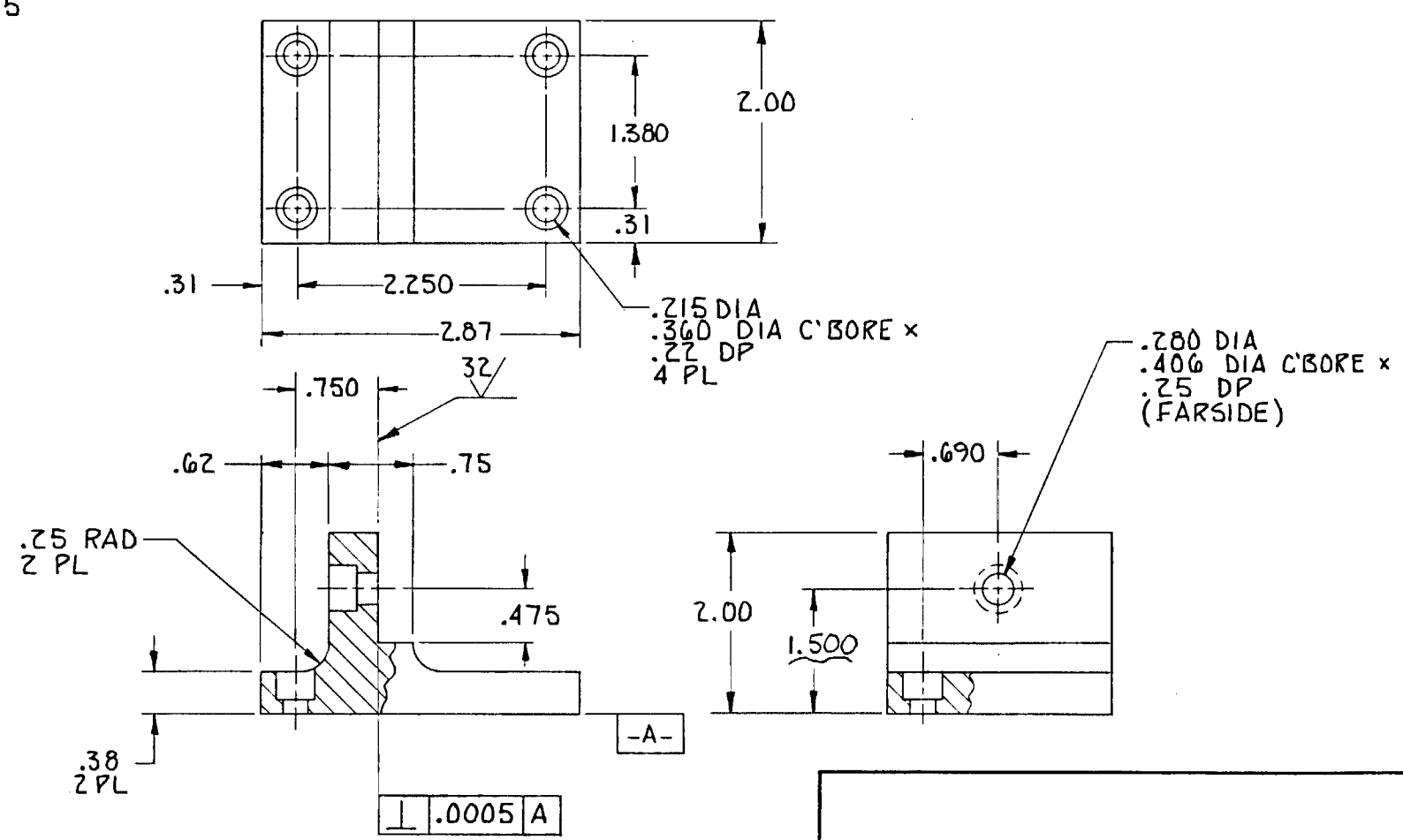
SCALE: 1/1	APPROVED BY	DRAWN BY KMA
DATE: 17JUL89		

MOUNT, FORCE SENSOR – LEFT

MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-216

NOTES:

1. FINISH ALL OVER 63 EXCEPT AS NOTED
2. REMOVE BURRS AND BREAK SHARP EDGES .015



TOLERANCES		
X/x	.XX	.XXX
± 1/32	± .01	± .005

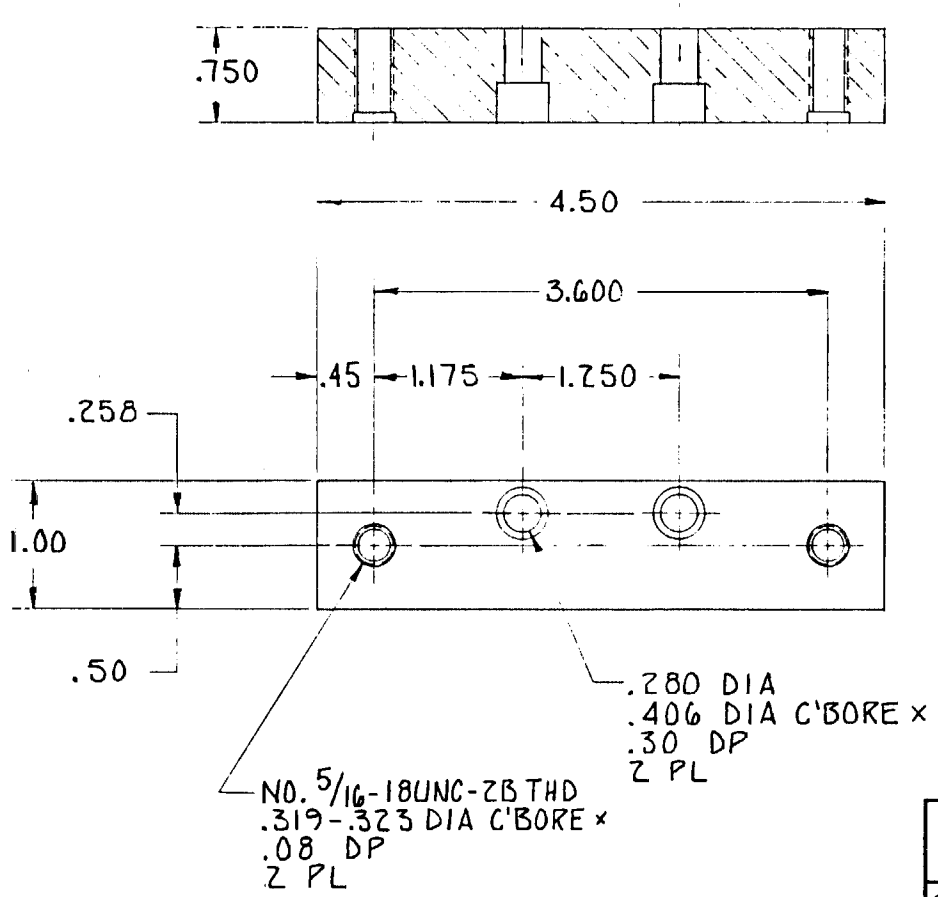
SCALE: 1/1	APPROVED BY	DRAWN BY KMA
DATE: 18 JUL 89		

MOUNT, FORCE SENSOR- RIGHT

MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-217

NOTES:

1. FINISH ALL OVER 32
2. REMOVE BURRS AND BREAK SHARP EDGES .015



TOLERANCES		
X/X	.XX	.XXX
± 1/32	± .01	± .005

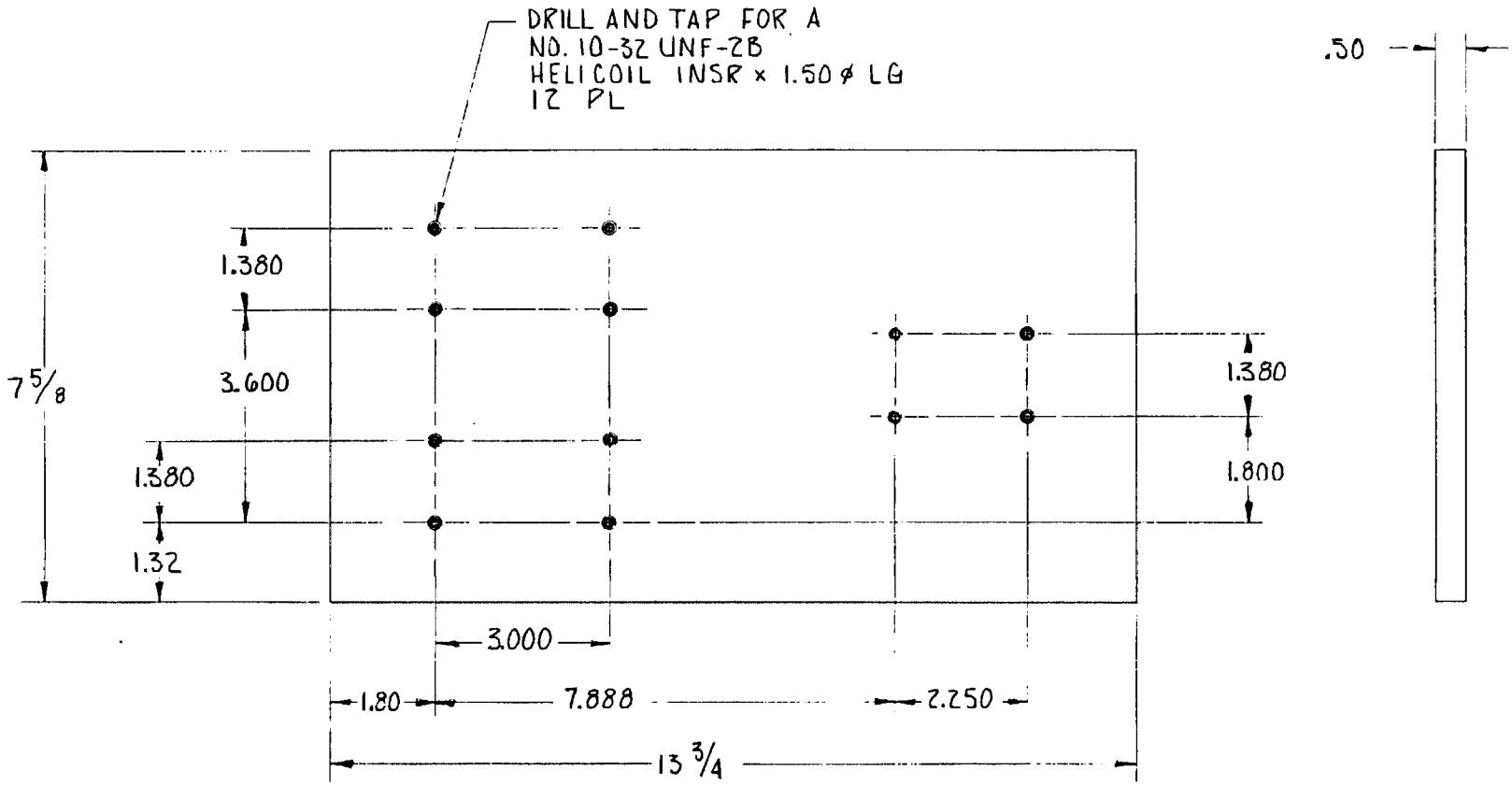
SCALE: 1/1	APPROVED BY	DRAWN BY KMA
DATE: 18 JUL 89		

BLOCK, SENSOR/FRAME INTERFACE

MATL: 302 ST. ST. OR EQUIV.	FINISH: NONE	DRAWING NUMBER 1009-218

NOTES:

1. FINISH WHERE MACHINED $\sqrt{63}$
2. REMOVE BURRS AND BREAK SHARP EDGES .015



TOLERANCES		
X/X	.XX	.XXX
±1/32	±.01	±.005

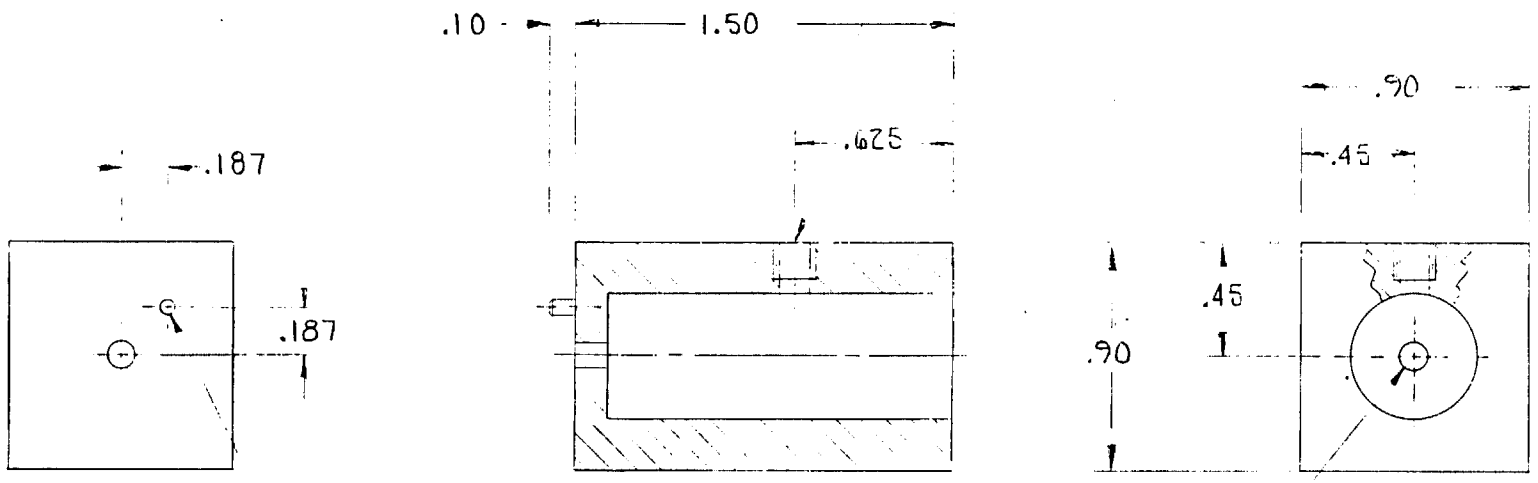
SCALE: 1/2	APPROVED BY:	DRAWN BY KMA
DATE: 19JUL89		

BASE PLATE,
FORCE SENSOR TEST FIXTURE

MATL: ALUM ALLOY 6061 T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-219

NOTES:

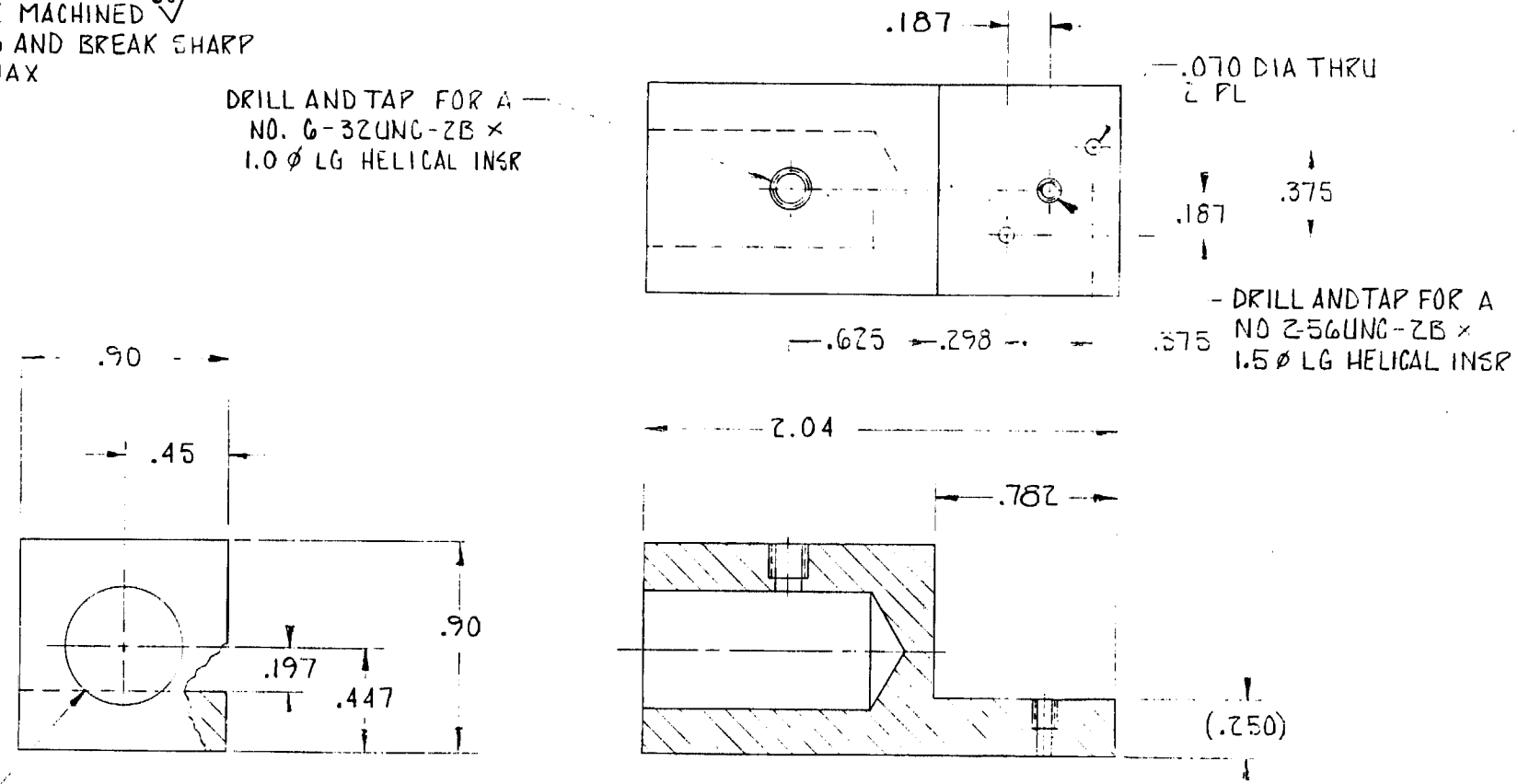
1. FINISH WHERE MACHINED 63
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX



TOLERANCES		
X/x	.XX	.XXX
± 1/32	±.01	±.005

SCALE: 2/1	APPROVED BY:	DRAWN BY KMA
DATE: 4AUG89		
WINDING PLATE, X-AXIS		
MATL: ALUM ALLOY 6061-T651		DRAWING NUMBER 1009-220

NOTES:
1. FINISH WHERE MACHINED 63
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX



TOLERANCES		
X/x	.XX	.XXX
± 1/32	±.01	±.005

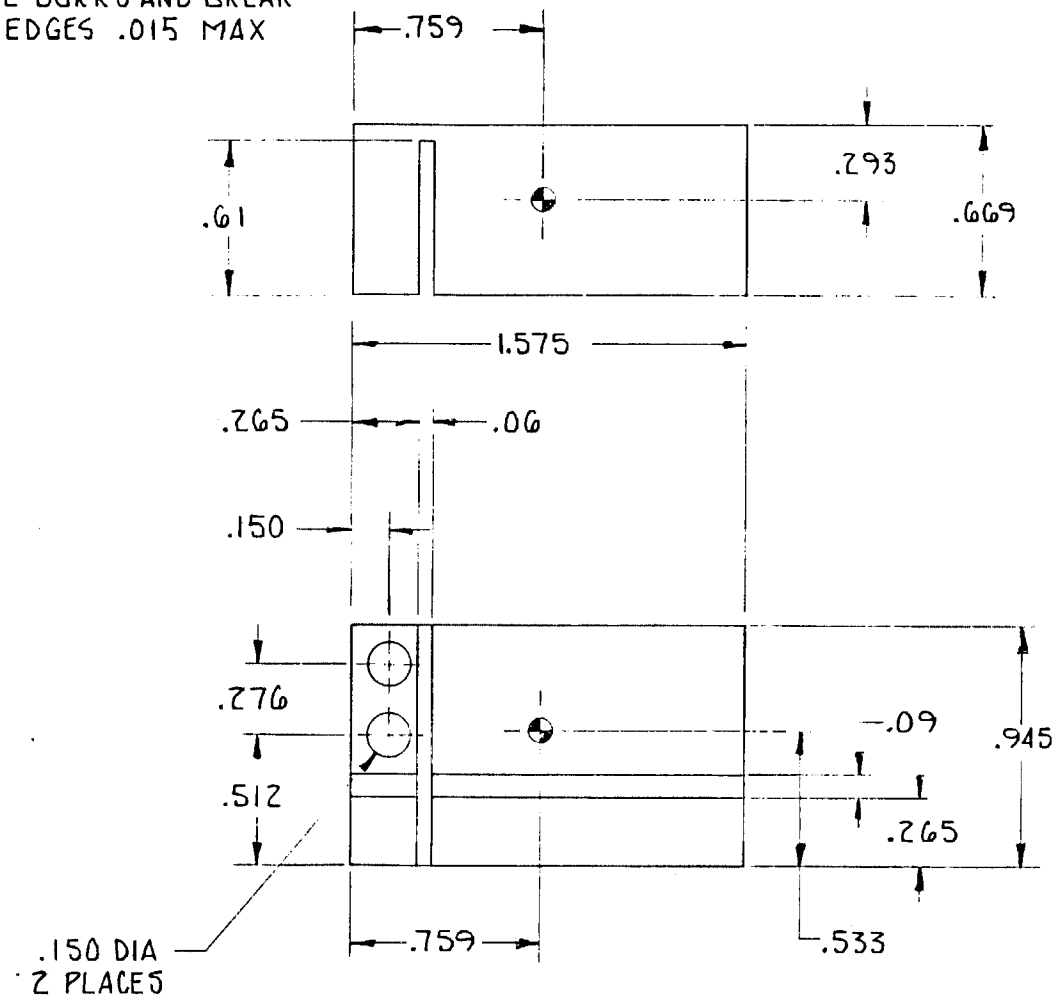
SCALE: 2/1	APPROVED BY	DRAWN BY KMA
DATE: 4 AUG 89		

WINDING PLATE, Z-AXIS

MATL: ALUM ALLOY 6061-T651	DRAWING NUMBER 1009-221	REV A

NOTES:

1. FINISH WHERE MACHINED 63
2. REMOVE BURRS AND BREAK SHARP EDGES .015 MAX



TOLERANCES		
X/X	.XX	.XXX
±1/32	± .01	± .005

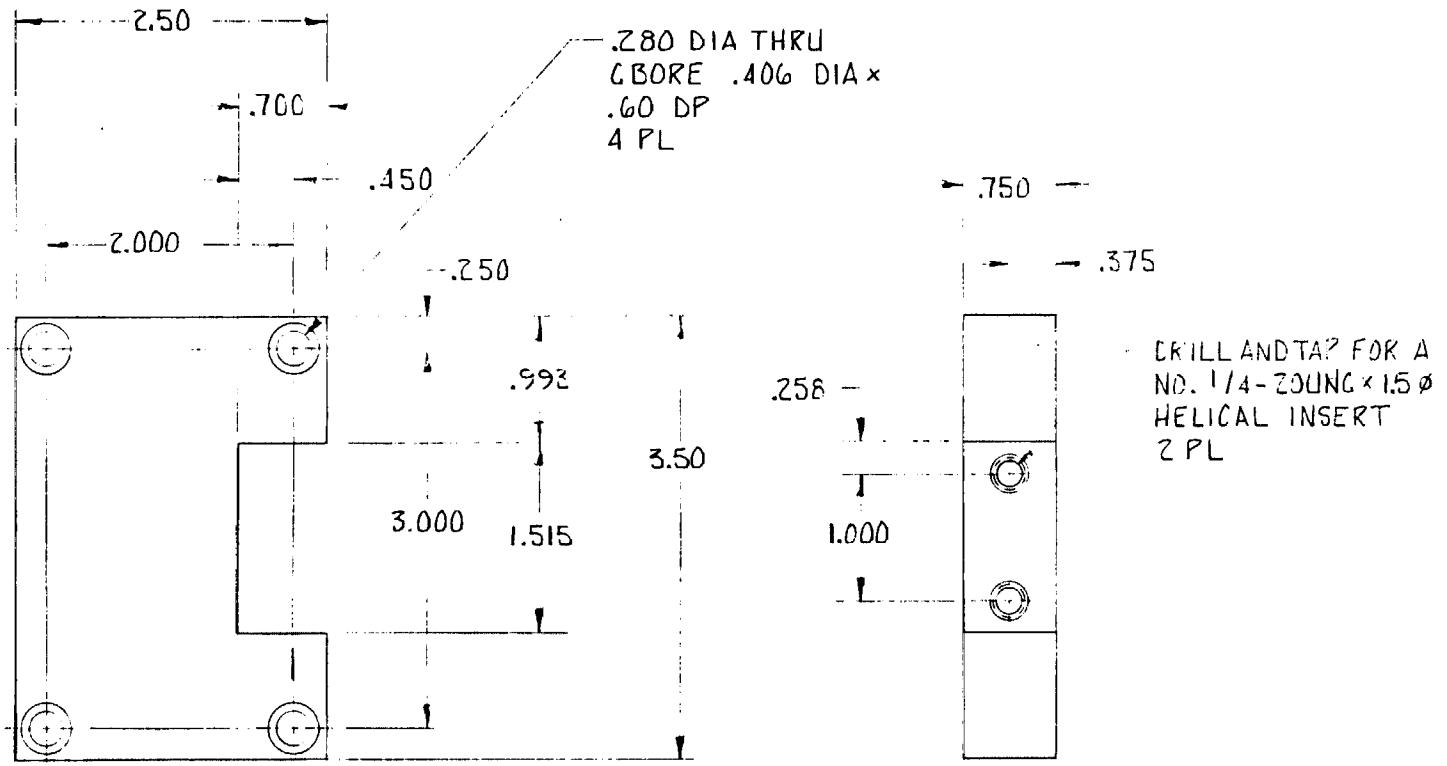
SCALE: 2/1	APPROVED BY	DRAWN BY KMA
DATE: 9AUG 89		

MOCK-UP, ENCODER BLOCK

MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-222

NOTES:

1. FINISH WHERE MACHINED $\sqrt{63}$
2. REMOVE BURRS AND BREAK SHARP EDGES .015



TOLERANCES		
X/x	.XX	.XXX
±1/32	±.01	±.005

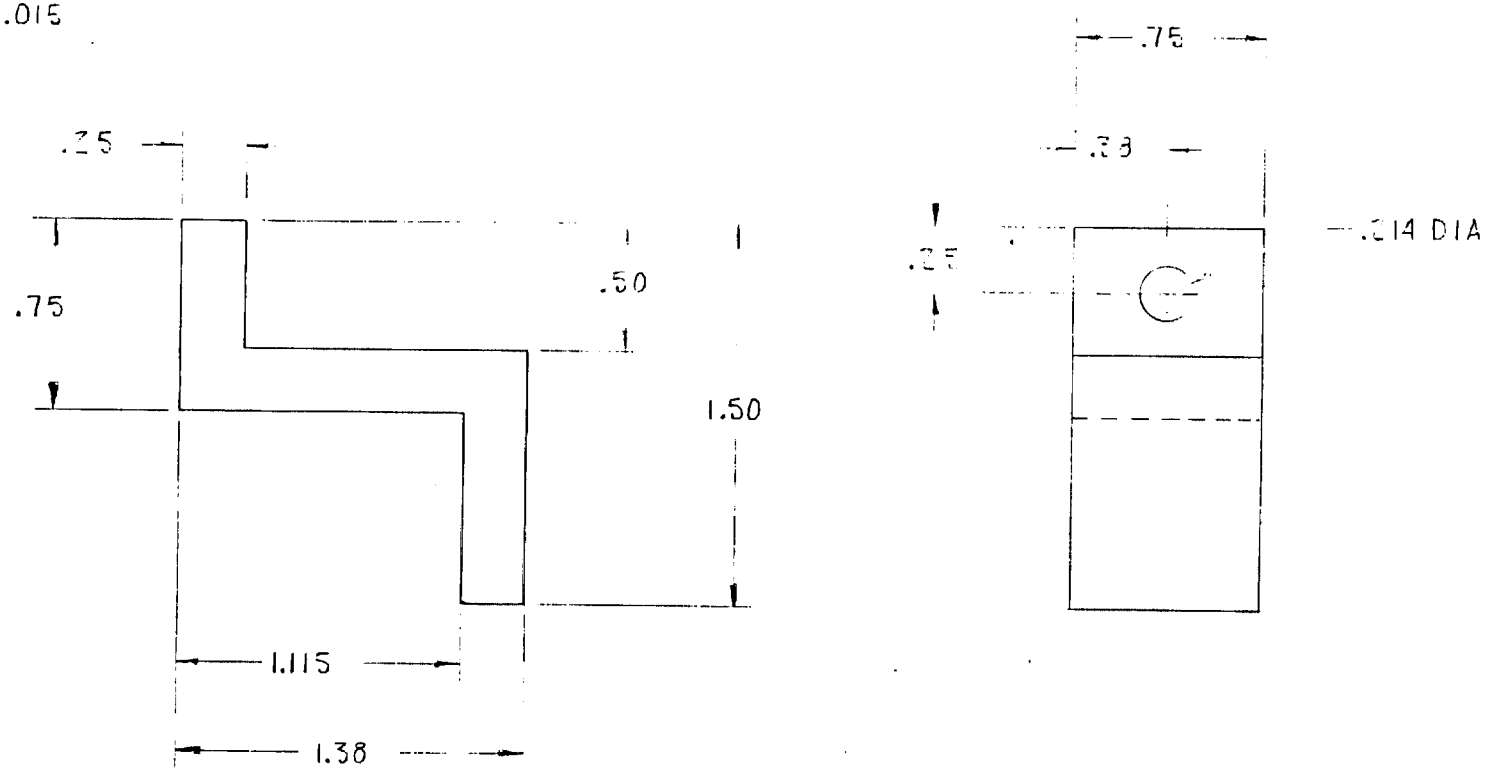
SCALE: 1/1	APPROVED BY: [signature]	DRAWN BY: KMA
DATE: 15AUG89		

BASE PLATE,
HOLDING FIXTURE

MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-223

NOTES:

1. FINISH WHERE MACHINED 63
2. REMOVE BURRS AND BREAK SHARP EDGES .015



TOLERANCES		
X/X	.XX	.XXX
± 1/32	± .01	± .005

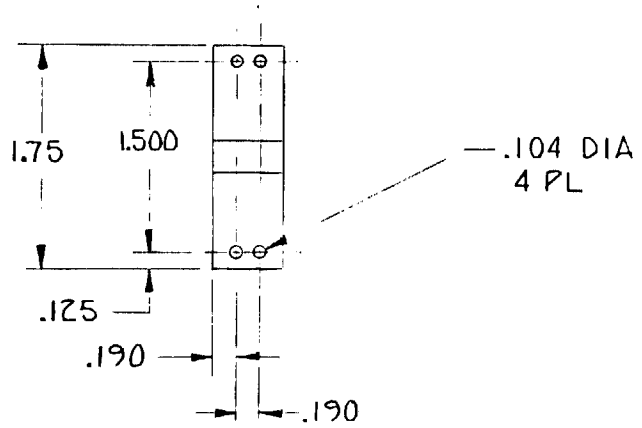
SCALE: 2/1	APPROVED BY	DRAWN BY KMA
DATE: 15AUG89		

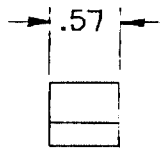
CLAMP, HOLDING FIXTURE

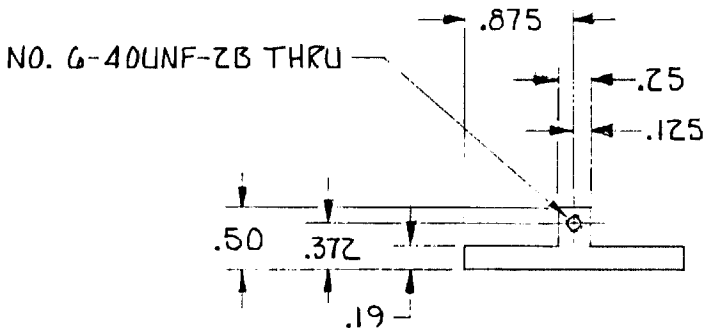
MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-224

NOTES:

1. FINISH WHERE MACHINED 32
2. REMOVE BURRS AND BREAK SHARP EDGES .015







TOLERANCES		
X/X	.XX	.XXX
±1/32	±.01	±.005

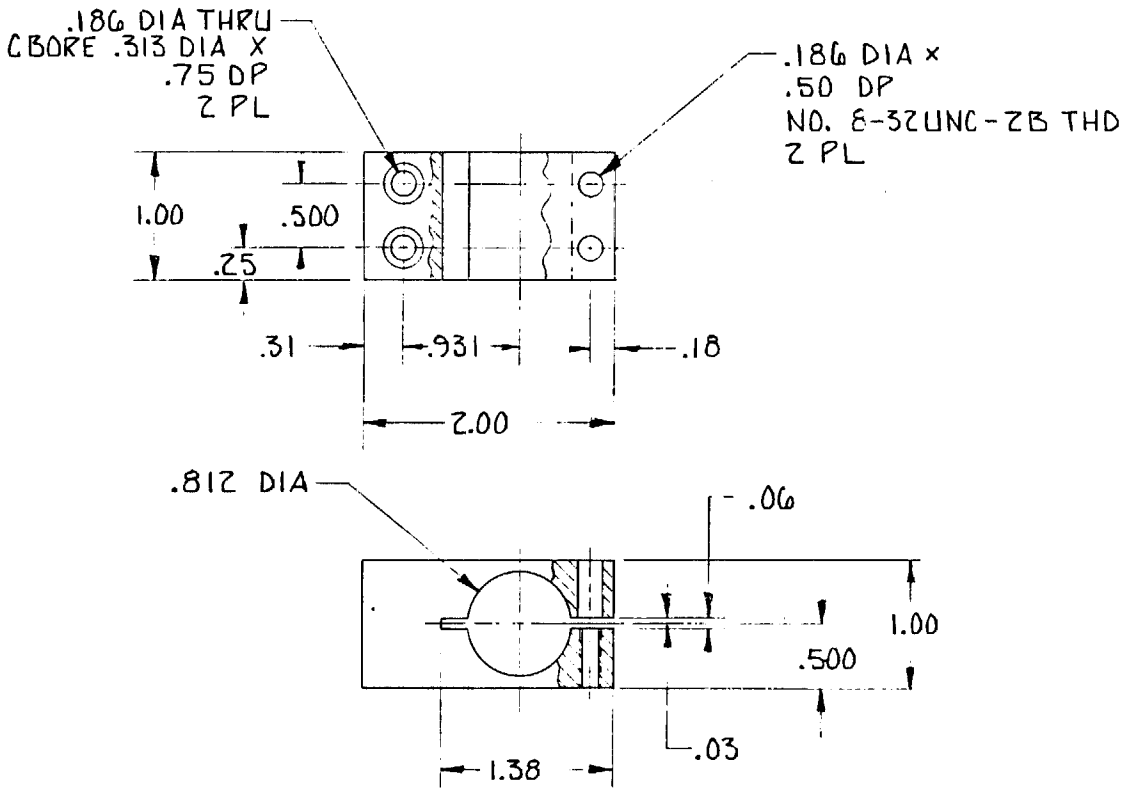
SCALE: 1/1	APPROVED BY:	DRAWN BY: KMA
DATE: 29AUG89		

HOLDER, ROD – LVDT

MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-225

NOTES:

1. FINISH WHERE MACHINED 32
2. REMOVE BURRS AND BREAK SHARP EDGES .015

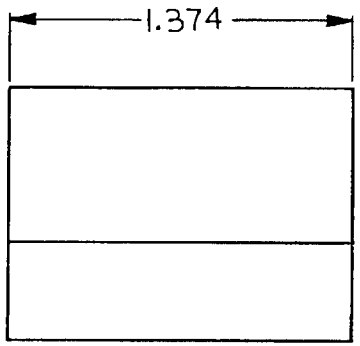


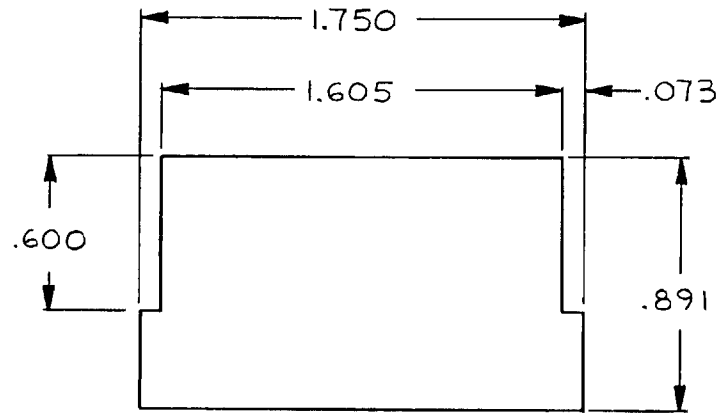
TOLERANCES		
X/x	.XX	.XXX
± 1/32	±.01	±.005

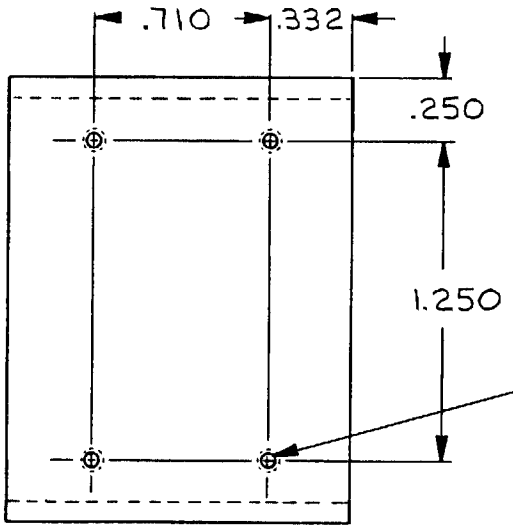
SCALE: 1/1	APPROVED BY	DRAWN BY KMA
DATE: 29AUG89		

MOUNT, LVDT

MATL: ALUM ALLOY 6061-T651	FINISH: BLACK ANODIZE	DRAWING NUMBER 1009-226







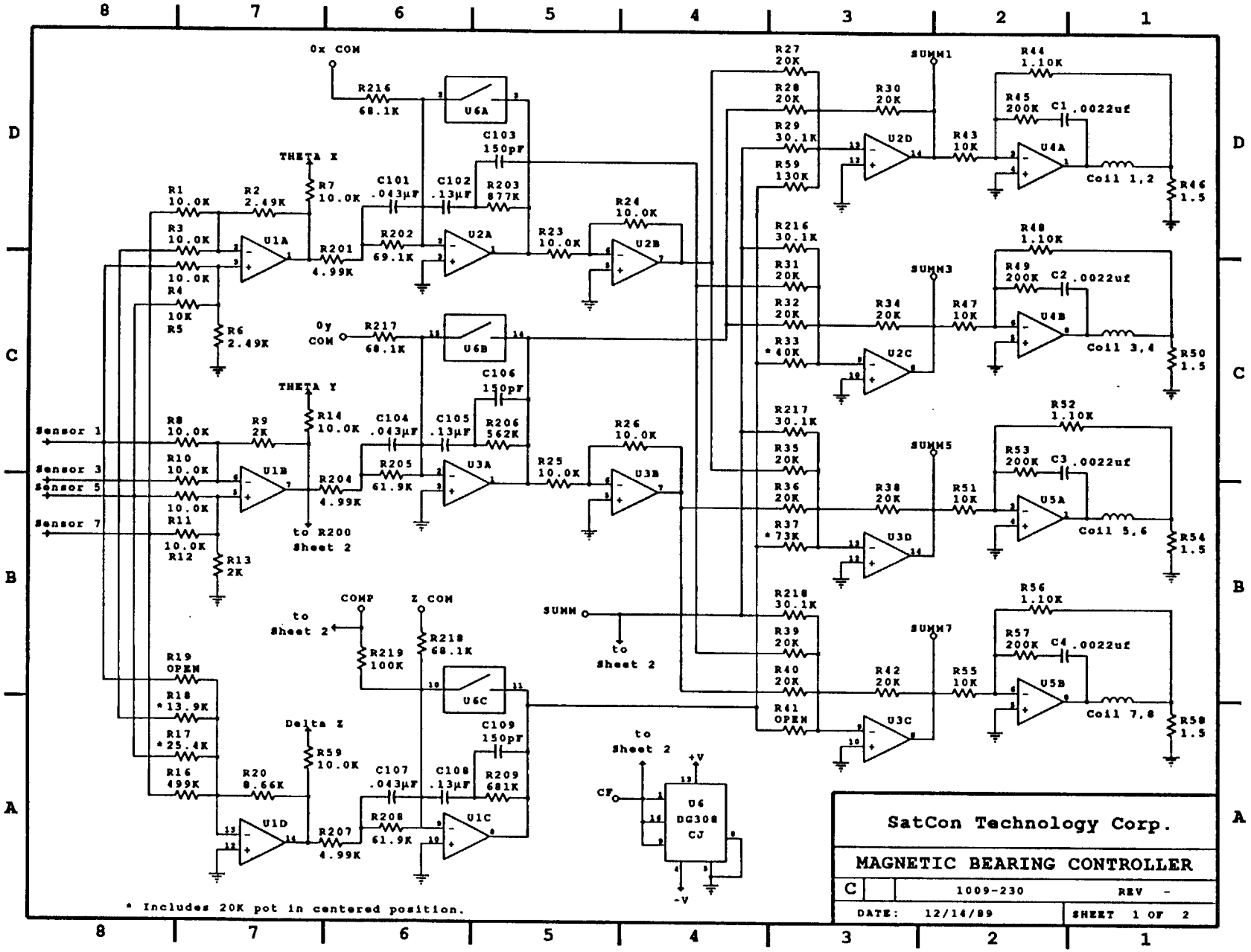
.086-52 UNC-2B X .25 DEEP
4 PLACES

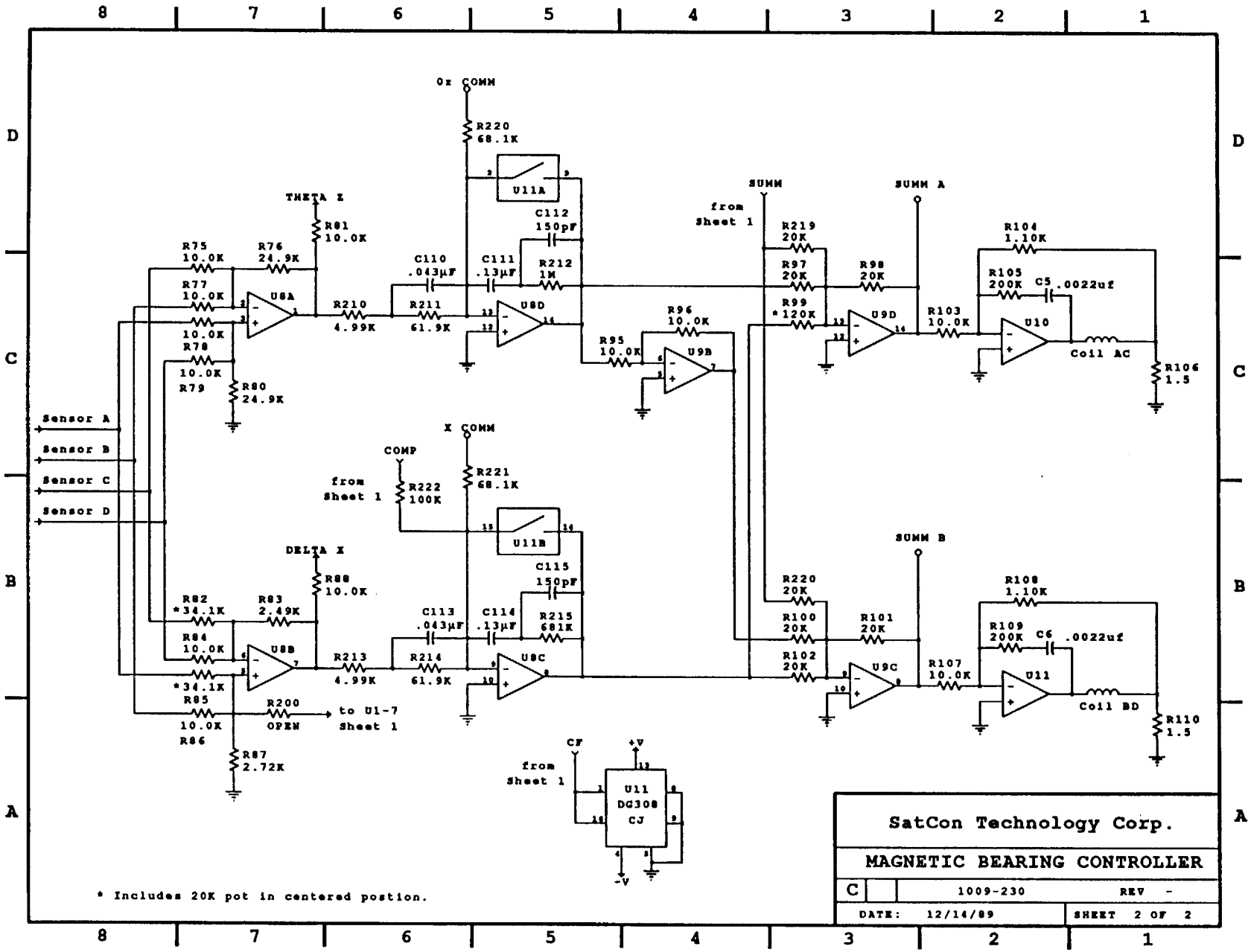
NOTES:
1. UNLESS OTHERWISE SPECIFIED TOLERANCE ARE ± .005
2. MATERIAL~ AL ALY 6061-T6

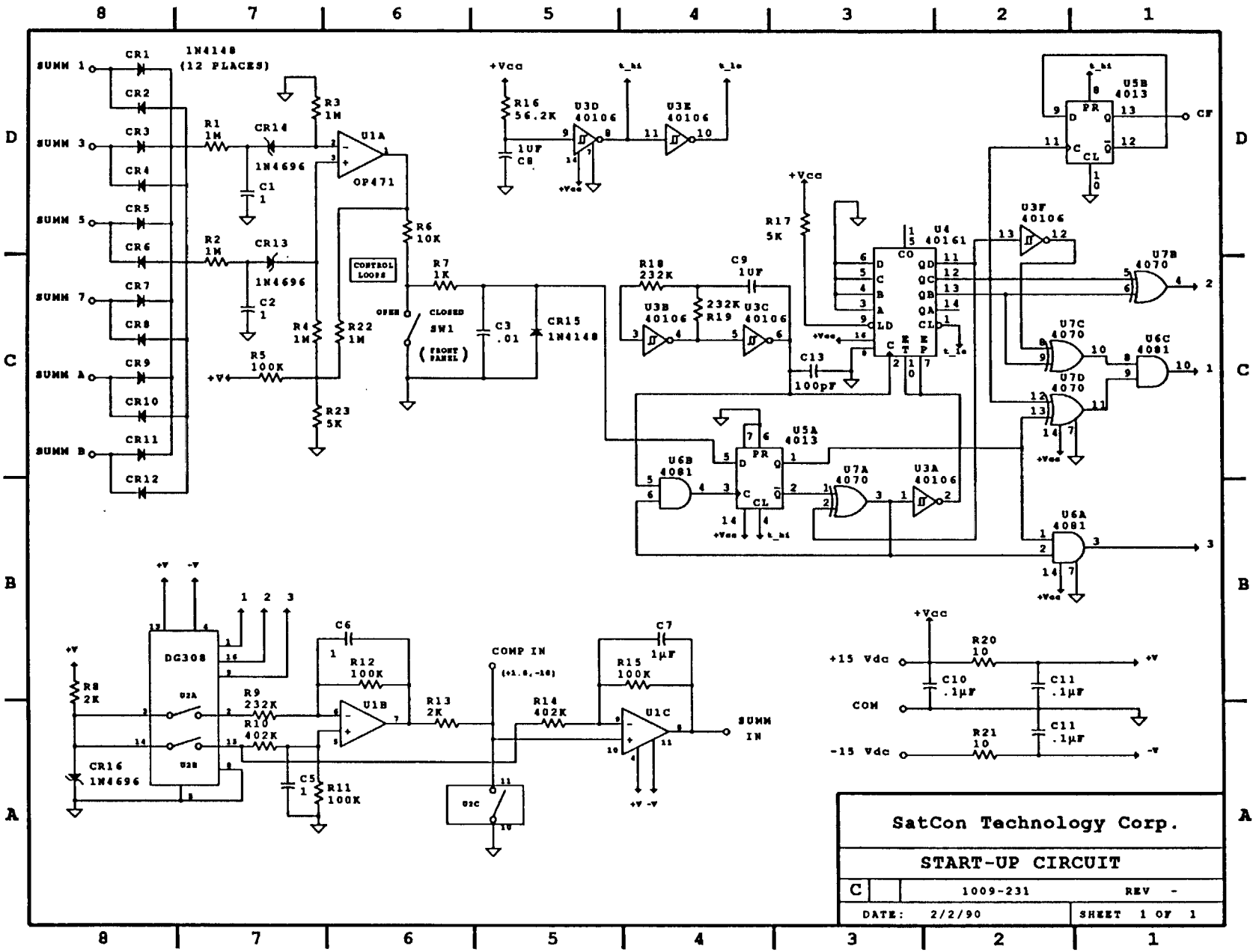
SCALE: 2/1	APPROVED BY	DRAWN BY J. TYLUS
DATE: 4-19-90		

OPTICAL HEAD MOCK-UP

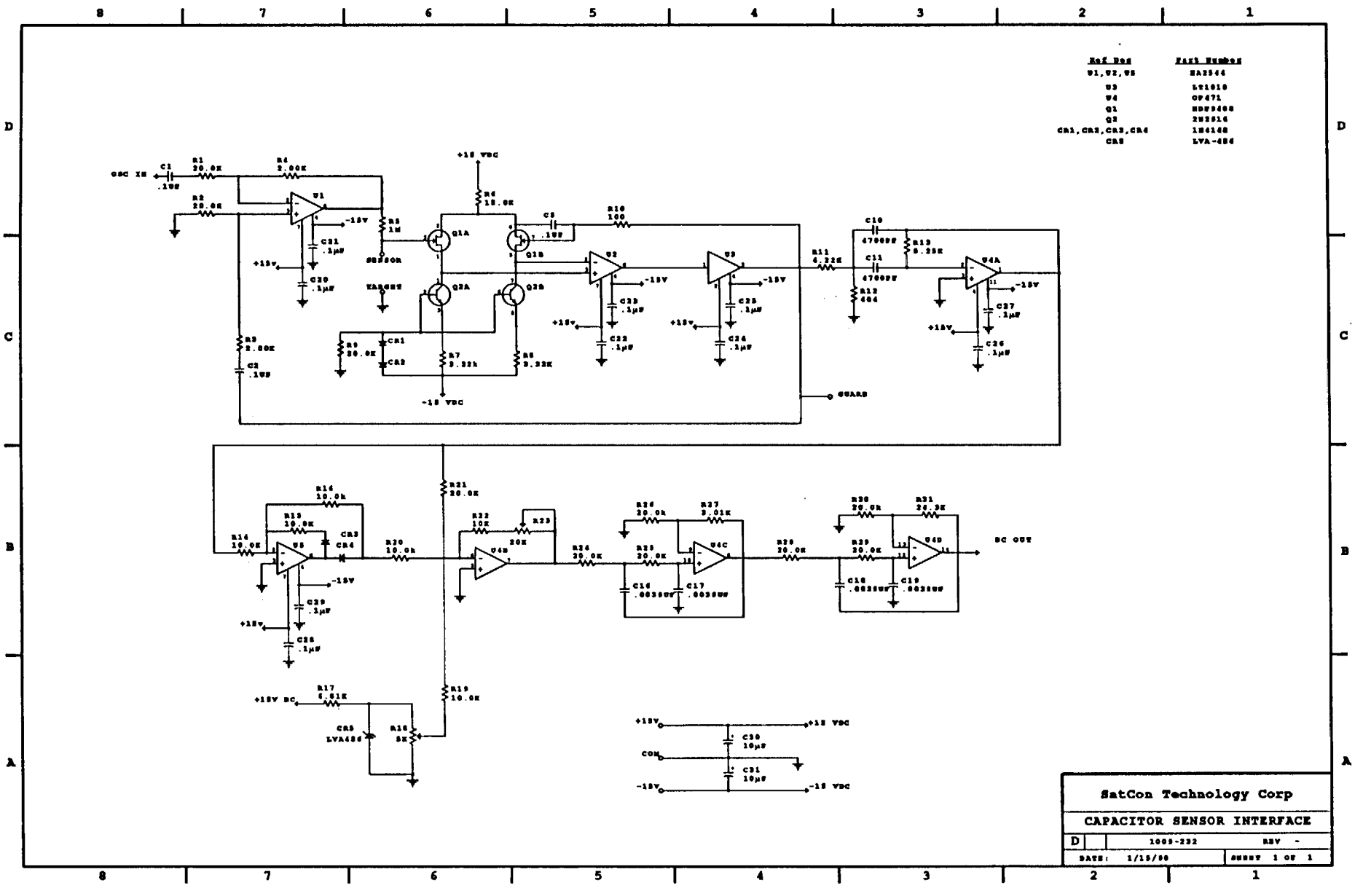
DRAWING NUMBER 1009-229

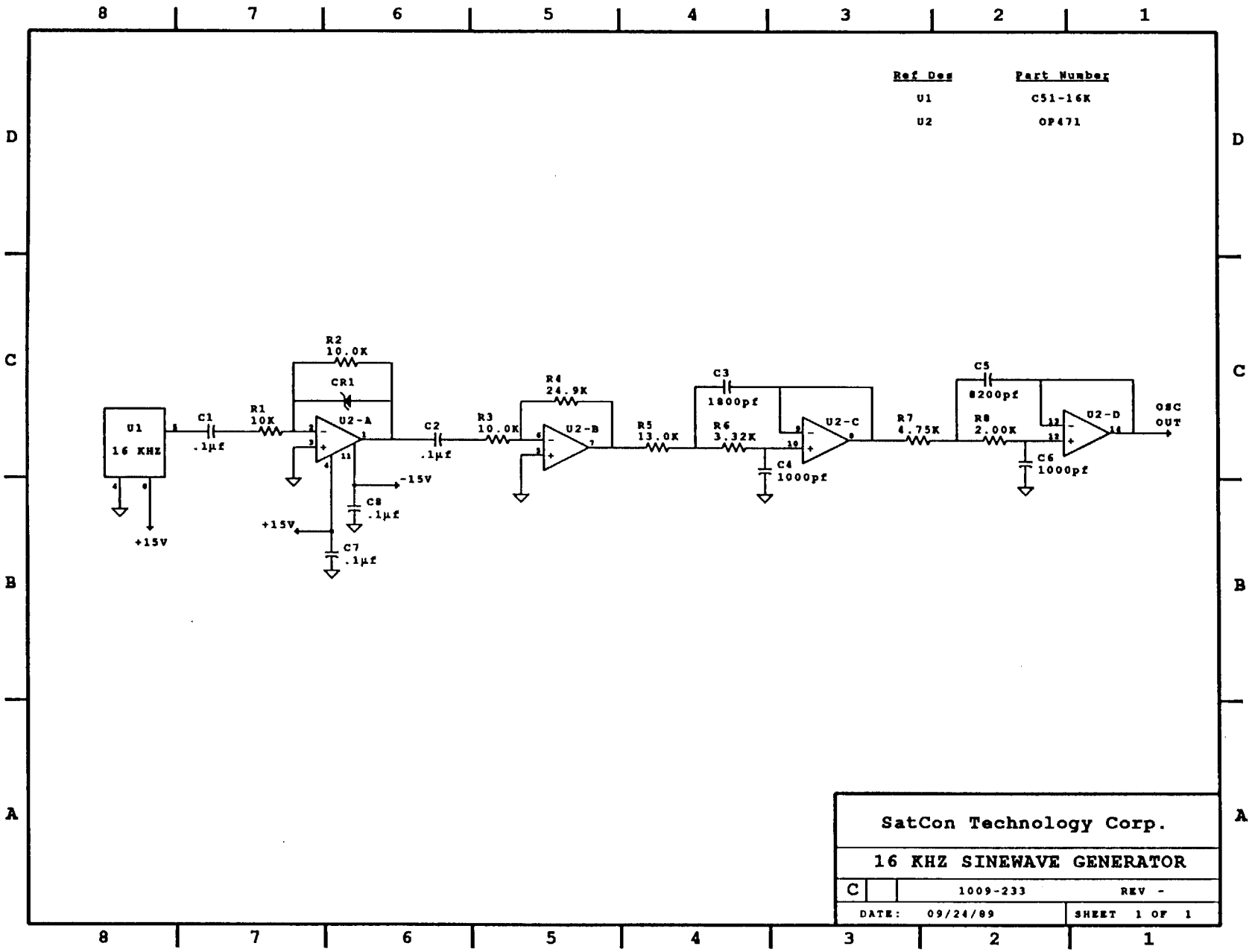

0x COM
R216 68.1K
U6A
C103 150pF
THETA X
R7 10.0K
C101 .043µF
C102 .13µF
R203 877K
R1 10.0K
R2 2.49K
R3 10.0K
10.0K
R4 10K
R5
R6 2.49K
U1A
R201 4.99K
R202 69.1K
U2A
R23 10.0K
R24 10.0K
U2B
0y COM
R217 68.1K
U6B
C106 150pF
THETA Y
R14 10.0K
C104 .043µF
C105 .13µF
R206 562K
Sensor 1
Sensor 3
Sensor 5
Sensor 7
R8 10.0K
R9 2K
R10 10.0K
10.0K
R11 10.0K
R12
R13 2K
U1B
R204 4.99K
R205 61.9K
U3A
R25 10.0K
R26 10.0K
U3B
to R200 Sheet 2
COMP
to Sheet 2
Z COM
R218 68.1K
R219 100K
U6C
SUMM
to Sheet 2
R19 OPEN
R18 *13.9K
R17 *25.4K
R16 499K
R20 8.66K
Delta Z
R59 10.0K
C107 .043µF
C108 .13µF
C109 150pF
R209 681K
R208 61.9K
U1C
R207 4.99K
U1D
to Sheet 2
+V
CF
U6 DG308 CJ
-V
R27 20K
R28 20K
R29 30.1K
R59 130K
R30 20K
U2D
SUMM1
R43 10K
R44 1.10K
R45 200K
C1 .0022uf
U4A
Coil 1,2
R46 1.5
R216 30.1K
R31 20K
R32 20K
R33 *40K
R34 20K
U2C
SUMM3
R47 10K
R48 1.10K
R49 200K
C2 .0022uf
U4B
Coil 3,4
R50 1.5
R217 30.1K
R35 20K
R36 20K
R37 *73K
R38 20K
U3D
SUMM5
R51 10K
R52 1.10K
R53 200K
C3 .0022uf
U5A
Coil 5,6
R54 1.5
R218 30.1K
R39 20K
R40 20K
R41 OPEN
R42 20K
U3C
SUMM7
R55 10K
R56 1.10K
R57 200K
C4 .0022uf
U5B
Coil 7,8
R58 1.5
* Includes 20K pot in centered position.
SatCon Technology Corp.
MAGNETIC BEARING CONTROLLER
C
1009-230
REV -
DATE: 12/14/89
SHEET 1 OF 2

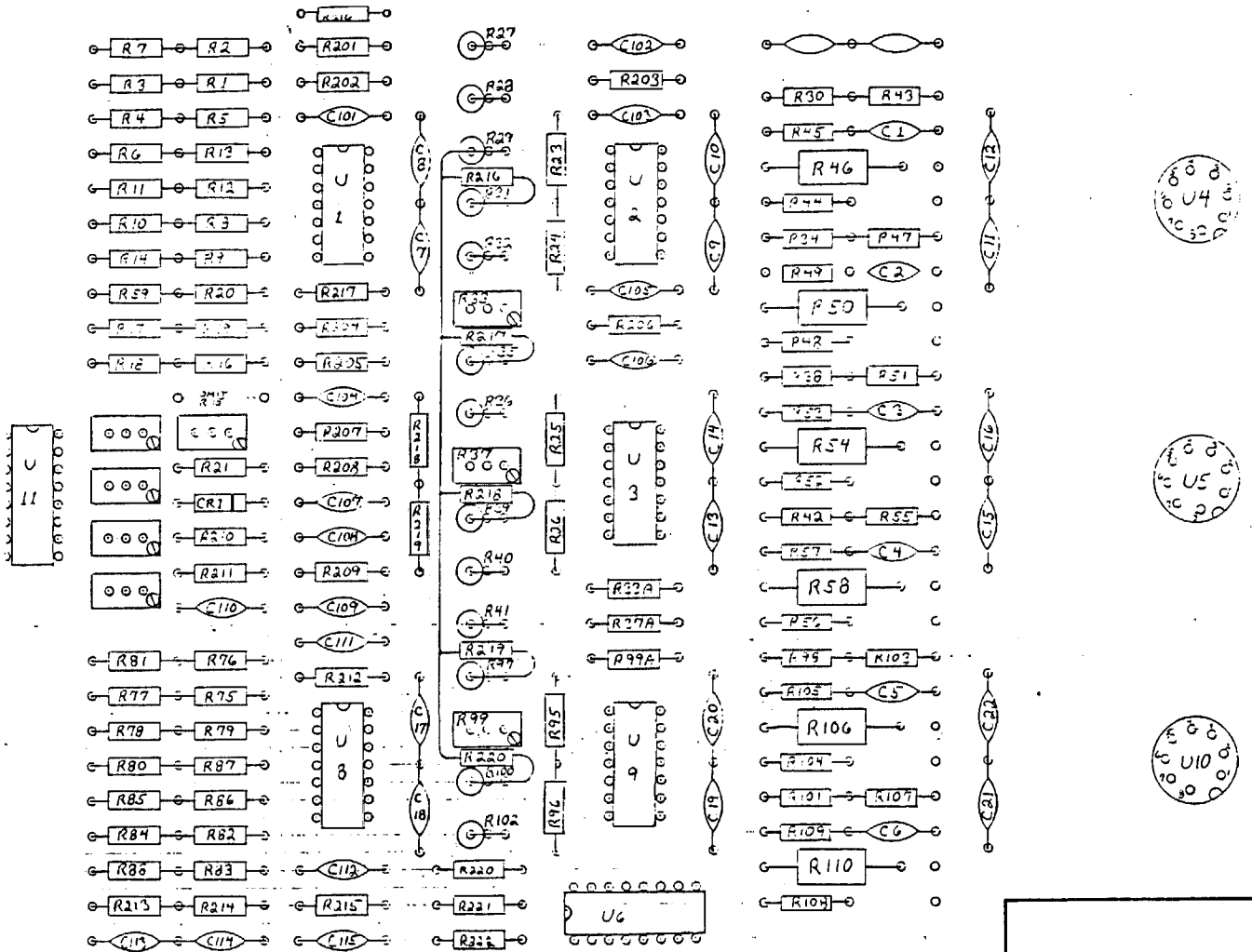

0z COMM
R220
68.1K
U11A
THETA Z
R81
10.0K
C112
150pF
SUMM
from
Sheet 1
SUMM A
R219
20K
R104
1.10K
R75
10.0K
R76
24.9K
C110
.043µF
C111
.13µF
R212
1M
R97
20K
R98
20K
R105
200K
C5 .0022uf
R77
10.0K
U8A
R210
4.99K
R211
61.9K
U8D
R99
*120K
U9D
R103
10.0K
U10
R96
10.0K
R95
10.0K
U9B
Coil AC
R106
1.5
R78
10.0K
R79
R80
24.9K
Sensor A
Sensor B
Sensor C
Sensor D
X COMM
COMP
from
Sheet 1
R222
100K
R221
68.1K
U11B
SUMM B
DELTA X
R88
10.0K
C115
150pF
R220
20K
R108
1.10K
R82
*34.1K
R83
2.49K
C113
.043µF
C114
.13µF
R215
681K
R100
20K
R101
20K
R109
200K
C6 .0022uf
R84
10.0K
U8B
R213
4.99K
R214
61.9K
U8C
R102
20K
U9C
R107
10.0K
U11
*34.1K
R85
10.0K
R200
OPEN
to U1-7
Sheet 1
Coil BD
R110
1.5
R86
R87
2.72K
CF
+V
from
Sheet 1
U11
DG308
CJ
-V
* Includes 20K pot in centered postion.
SatCon Technology Corp.
MAGNETIC BEARING CONTROLLER
C
1009-230
REV -
DATE: 12/14/89
SHEET 2 OF 2



SatCon Technology Corp.			
START-UP CIRCUIT			
C		1009-231	REV -
DATE: 2/2/90			SHEET 1 OF 1


Ref Des
Part Number
U1,U2,U3
U5
U4
Q1
Q2
CR1,CR2,CR3,CR4
CR5
LVA-484
SatCon Technology Corp
CAPACITOR SENSOR INTERFACE
1003-232
REV -
DATE: 1/15/98
SHEET 1 OF 1

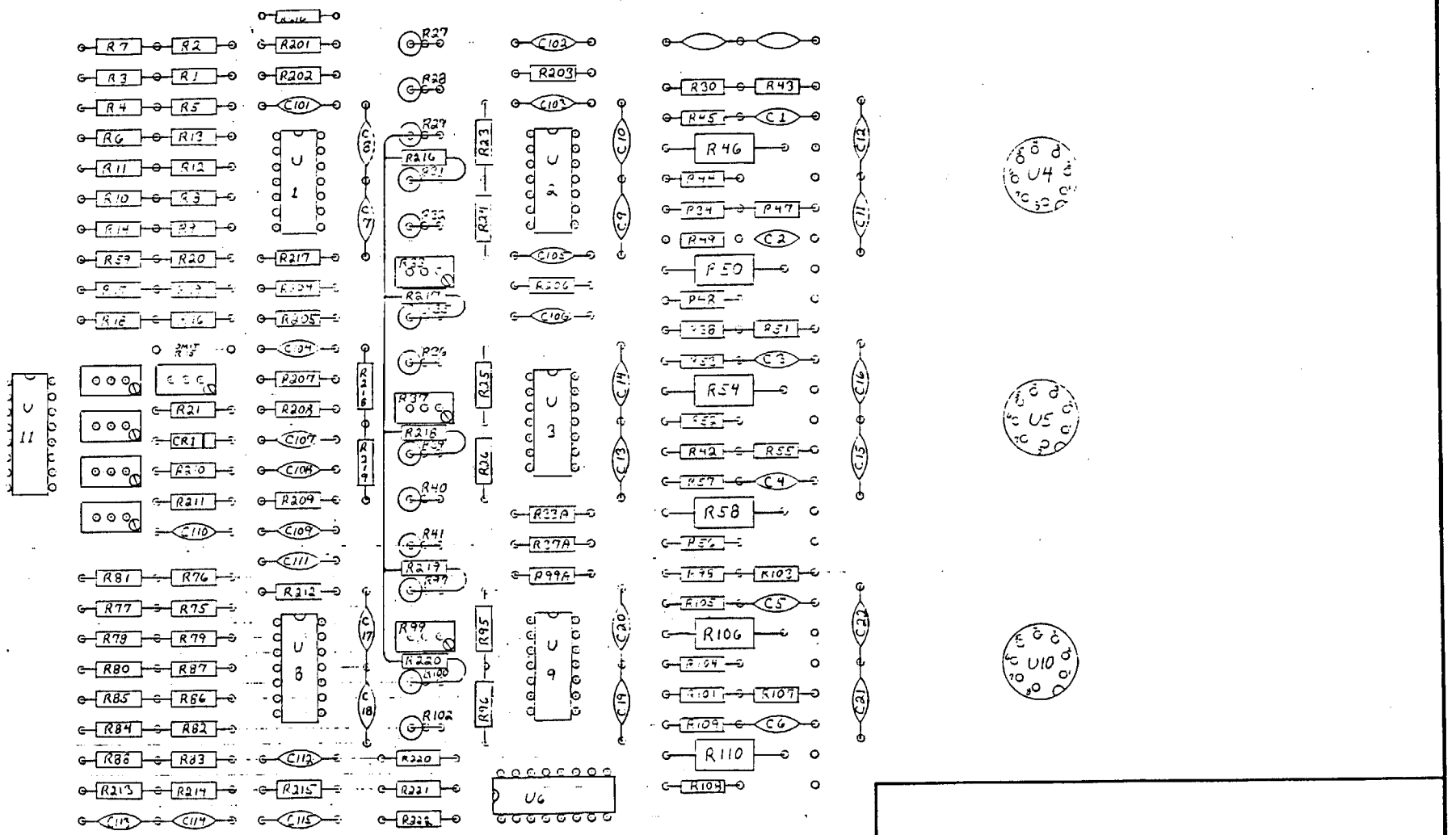

Ref Des
Part Number
U1
C51-16K
U2
OP471
U1
16 KHZ
C1
.1µf
R1
10K
R2
10.0K
CR1
U2-A
C2
.1µf
R3
10.0K
R4
24.9K
U2-B
R5
13.0K
C3
1800pf
R6
3.32K
U2-C
C4
1000pf
R7
4.75K
C5
8200pf
R8
2.00K
U2-D
C6
1000pf
OSC
OUT
-15V
C8
.1µf
+15V
C7
.1µf
+15V
SatCon Technology Corp.
16 KHZ SINEWAVE GENERATOR
C
1009-233
REV -
DATE: 09/24/89
SHEET 1 OF 1



SCALE:	APPROVED BY A. L. Arakawa	DRAWN BY
DATE:		

LAYOUT, MAGNETIC BEARING CONTROLLER

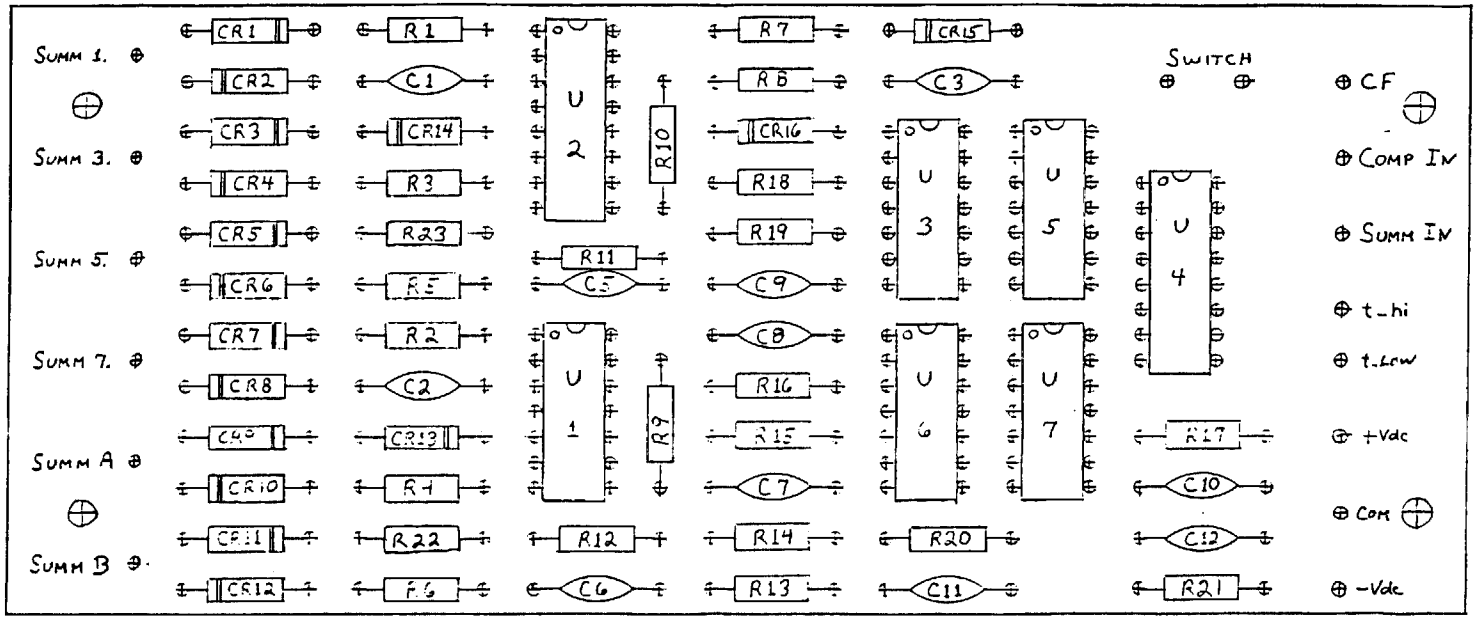
DRAWING NUMBER 1009-240



SCALE:	APPROVED BY: A. L. Arkeny	DRAWN BY
DATE:		

LAYOUT, MAGNETIC BEARING CONTROLLER

DRAWING NUMBER
1009-240



R1 = 1 MEG
R2 = 1 MEG
R3 = 1 MEG
R4 = 1 MEG
R5 = 100K
R6 = 10 K
R7 = 1 K
R8 = 2 K
R9 = 90.9 K
R10 = 402 K

R11 = 100 K
R12 = 100 K
R13 = 2 K
R14 = 100 K
R15 = 100 K
R16 = 56.2 K
R17 = 5 K
R18 = 232 K
R19 = 232 K
R20 = 10 Ω
R21 = 10 Ω

R22 = 1MEG.
R23 = 5K

CR1 = IN4148
CR2 = IN4148
CR3 = IN4148
CR4 = IN4148
CR5 = IN4148
CR6 = IN4148
CR7 = IN4148
CR8 = IN4148
CR9 = IN4148
CR10 = IN4148

CR11 = IN4148
CR12 = IN4148
CR13 = IN4696
CR14 = IN4696
CR15 = IN4148
CR16 = IN4696

C1 = 1 μf
C2 = 1 μf
C3 = .01 μf

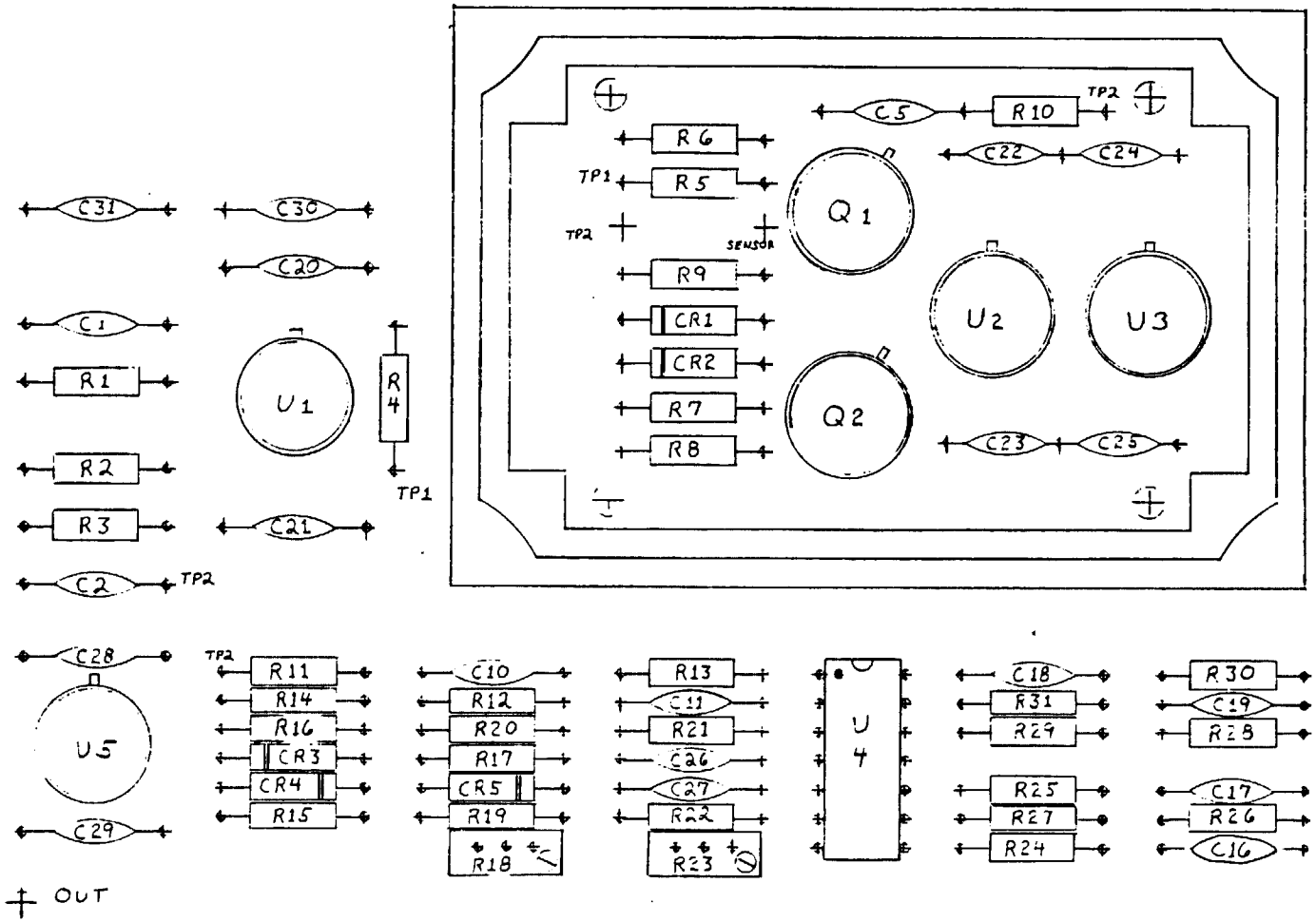
C4 = OMIT
C5 = 1 μf
C6 = 1 μf
C7 = 150 pf
C8 = 1 μf
C9 = 1 μf
C10 = .1 μf
C11 = .1 μf
C12 = .1 μf

U1 = OP471
U2 = DG308
U3 = 4069
U4 = 40161
U5 = 4013
U6 = 4081
U7 = 4070

SCALE:	APPROVED BY A. L. Hathaway	DRAWN BY	
DATE:			

LAYOUT, START-UP CIRCUIT

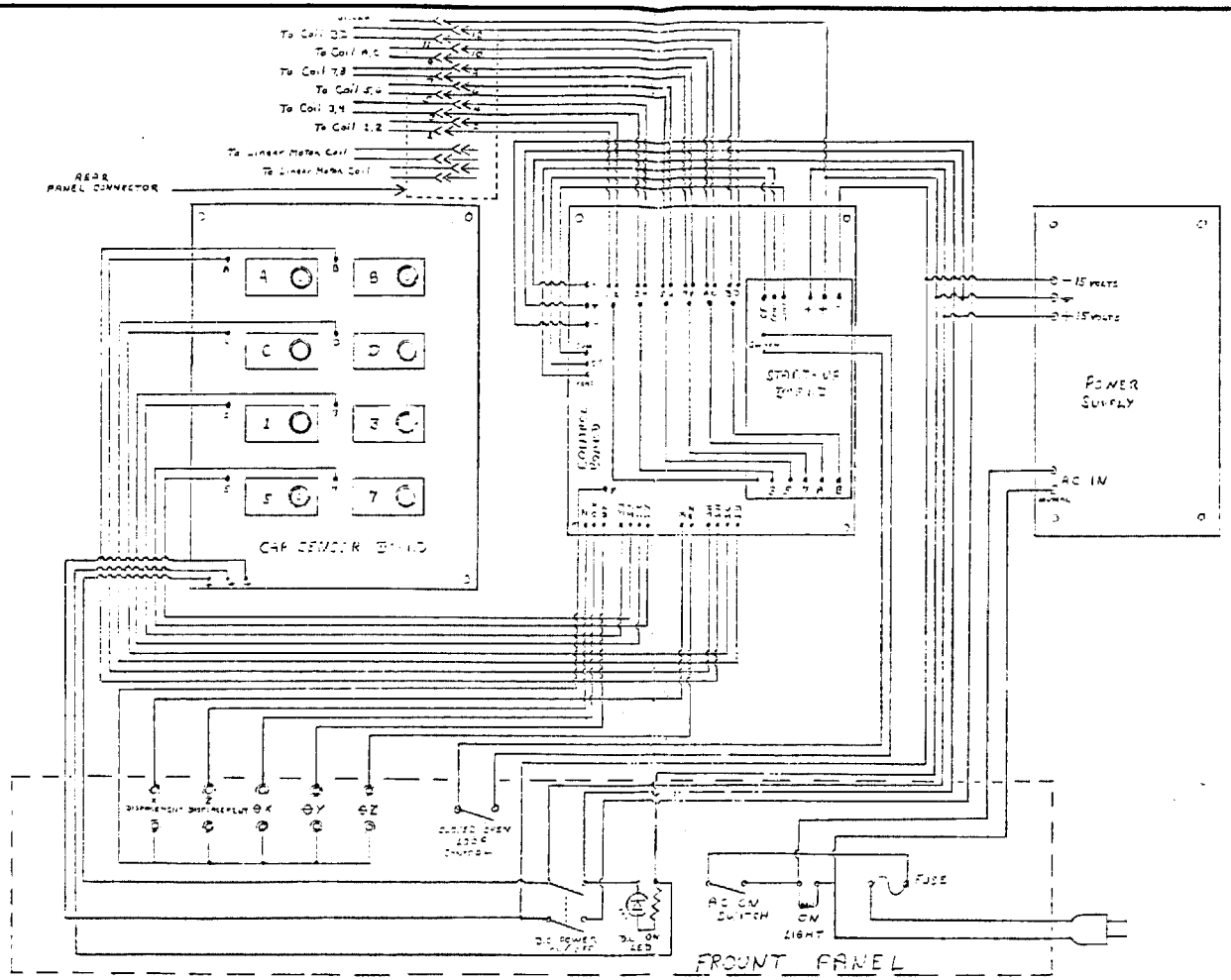
DRAWING NUMBER 1009-241



SCALE:	APPROVED BY: R L Hockney	DRAWN BY
DATE:		REVISED

LAYOUT, CAPACITIVE SENSOR INTERFACE

DRAWING NUMBER	REV
1009-242	A



SCALE:	APPROVED BY: C L Hickey	DRAWN BY
DATE:		

CHASSIS INTERWIRING DIAGRAM

DRAWING NUMBER 1009-243